An Update on Periprosthetic Joint Infection

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Disclosures

- None

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OUTLINE

- MSIS
  - Defining PJI
  - International Consensus Meeting

- Literature Review
  - Diagnosis
  - Prevention
  - Outcomes
  - Treatment
DEFINITION?

It's a good thing Chuck raised his voice, because Pedro understood loud English.
New Definition for Periprosthetic Joint Infection
From the Workgroup of the Musculoskeletal Infection Society

- 1/2 Major Criteria OR
- 4/6 Minor Criteria

Caveat: PJI may be present if <4 criteria met

Will be modified w/ further research on novel dx approaches/tests

Based on the proposed criteria, definite PJI exists when:

1. There is a sinus tract communicating with the prosthesis; or
2. A pathogen is isolated by culture from at least two separate tissue or fluid samples obtained from the affected prosthetic joint; or
3. Four of the following six criteria exist:
   - Elevated serum erythrocyte sedimentation rate (ESR) and serum C-reactive protein (CRP) concentration,
   - Elevated synovial leukocyte count,
   - Elevated synovial neutrophil percentage (PMN%),
   - Presence of purulence in the affected joint,
   - Isolation of a microorganism in one culture of periprosthetic tissue or fluid, or
   - Greater than five neutrophils per high-power field in five high-power fields observed from histologic analysis of periprosthetic tissue at ×400 magnification.
August 2013, Philadelphia, PA

INTERNATIONAL CONSENSUS MEETING
400 delegates
52 countries
130 societies
15 workgroups

Woody Allen

“Everything you always wanted to know about PUS
★ But were afraid to ask”
WORKGROUPS

1. Mitigation & Education
2. Perioperative Skin Prep
3. Perioperative Antibiotics
4. Operative Environment
5. Blood Conservation
6. Prosthesis Selection
7. Diagnosis
8. Wound Management
9. Spacers
10. Irrigation & Debridement
11. Reimplantation- Antibiotic Rx & Timing
12. One Stage vs Two Stage
13. Management of Fungal/ Atypical PJI
14. Oral Antibiotic Therapy
15. Prevention of Late PJI
J Arthroplasty Oct 2013 Supplement

http://www.msis-na.org/international-consensus/
THE ERA OF THE BIOMARKER

DIAGNOSIS
Diagnostic accuracy of intra-articular C-reactive protein assay in periprosthetic knee joint infection – a preliminary study

Interleukin-6 in Serum and in Synovial Fluid Enhances the Differentiation between Periprosthetic Joint Infection and Aseptic Loosening
Thomas M. Randau, Max J. Friedrich, Matthias D. Wimmer, Ben Reichert, Dominik Kuberra, Birgit Stoffel-Wagner, Andreas Limmer, Dieter C. Wirtz, Sascha Gravius

Synovial IL-6 AS Inflammatory Marker in Periprosthetic Joint Infections
Markus Lenski, Cand. med., Michael A. Scherer, Dr. med.

Human Beta-Defensin-3 for the Diagnosis of Periprosthetic Joint Infection and Loosening
Guo-Dong Liu, MD; Hong-Jun Yu, MD; Shan Ou, MD; Xi Luo, MD; Wei-Dong Ni, MD; Xian-Kai Huang, MD; Ji-Ying Chen, MD; Yan Wang, MD; Parvizi Javard, MD, FRCS; Jun Fei, MD
Diagnosing Periprosthetic Joint Infection

Has the Era of the Biomarker Arrived?

Carl Deirmengian MD, Keith Kardos PhD,
Patrick Kilmartin, Alexander Cameron, Kevin Schiller,
Javad Parvizi MD

- \( \approx 100 \) pts undergoing revision TJA
  - Included inflammatory arthropathy, and pts w/ prior abx
- Synovial fluid samples tested for 16 biomarkers
- 5 biomarkers predicted PJI w/ 100% sensitivity/specificity
- Human \( \alpha \)-defensin 1-3
- Neutrophil elastase 2
- Bactericidal/permeability-increasing protein
- Neutrophil gelatinase-associated lipocalin
- lactoferrin
50 pts w/ draining wounds/sinuses

<1/2 of superficial Cx concordant w/ deep Cx

More often polymicrobial

Yielded growth when deep Cx and further w/u suggested absence of infxn

Would have inappropriately changed abx regimen in 40+ %
Thresholds - acute hip

- Synovial WBC = 12,800
- %PMN = 89%
- CRP = 93mg/L

Thresholds - acute knee

- Synovial WBC = 10,700
- %PMN = 89%
- CRP = 95mg/L

Chronic PJI

- Synovial WBC = 1100-3000
- %PMN = 65%
- CRP = 30mg/L

Optimal cutoffs for synovial analysis 1 order of magnitude higher than chronic PJI
Using MSIS definition of PJI, reanalyzed thresholds of ESR >30mm/hr and CRP >10mg/L

- Chronic PJI- knee
  - ESR 46.5mm/hr, CRP 23.5mg/L

- Chronic PJI- hip
  - ESR 48.5mm/hr, CRP 13.5mg/L

- Acute PJI- hip/knee
  - ESR 54.5mm/hr, CRP 23.5mg/L
An ounce of prevention is worth a pound of cure.

PREVENTION
Prevention of Orthopaedic Implant Infection in Patients Undergoing Dental Procedures

Executive Summary on the AAOS/ADA Clinical Practice Guideline

1. The practitioner might consider discontinuing the practice of routinely prescribing prophylactic antibiotics for patients with hip and knee prosthetic joint implants undergoing dental procedures.

   Grade of Recommendation: Limited
Multicenter PRCT

60 pts w/ PJI

Abx pre-incision vs after Cx obtained

No difference in dx yield, nor concordance of cultures
Revision TKA (esp MR-staph) infection rate high

Initiated preop vanco + kefzol

2009-10-> 2011-12:

- Infection 7.9%-> 3.1% (p<0.05)
- MR-organism 4.2%-> 0.9% (p<0.05)

Identify high risk pts to target infection prevention strategies
Renewed Interest in One Stage Exchange Arthroplasty Treatment

Hans Wilhelm Buchholz
Prerequisities
- Preop ID of organism
- <2 prior failures

Operative Technique
- Radical debridement
- ALBC

Post-op
- 14 days of abx

Results
- 80-90% success @8yrs
N=157, chronic PJI, preop ID of bacteria, no/minor bone loss

**NO abx cement** + 12wks abx

Cumulative reinfection rate- 3.8% @2yrs, 5% @5yrs

- 9 aseptic revisions
- 21 deaths
Constantly choosing the lesser of two evils is still choosing evil.

(Jerry Garcia)

Static or Dynamic?

ANTIBIOTIC SPACERS
No significant difference in reinfection rate, complication rate

Articulating spacers w/ 10° in ROM (101° vs 91°)
  - However, no difference in functional scores
PJIsn’t just morbid…….

OUTCOMES

It’s DEADLY!!!
Mortality - Septic vs Aseptic revision

- **90d** - 3.7% vs 0.8%
- **1yr** - 10.6% vs 2%
- **2yrs** - 13.6% vs 3.9%
- **5yrs** - 25.9% vs 12.9%

After controlling for other variables, **PJII associated w/ 5-fold increase in mortality**
Summary - Do’s

- Uniform definition of PJI will facilitate future research
- Reference the MSIS consensus for any PJI related questions
- Molecular biomarkers will revolutionize diagnosis
- For 2 stage exchange, consider dynamic spacers
- Keep eyes peeled for further data on the 1 stage exchange
Summary- Don’t’s

- Do not culture draining wounds
- Do not withhold preop antibiotics
- Do not confuse thresholds for acute/chronic PJI
- No strong evidence for dental prophylaxis
- Do not underestimate the impact of PJI on morbidity/mortality
Thanks