What Is the Role of 1 vs 2 Stage in Periprosthetic Infection?

Thomas K. Fehring, MD
2017
OrthoCarolina Hip and Knee Center
Charlotte, NC
I (and/or my co-authors) have something to disclose.

Detailed disclosure information is available via:

“My Academy” app;
PERIPROSTHETIC INFECTION

Scope Of The Problem

2020

• 49,000 PJI Projected
• Projected Costs - $1.6 Billion

Kurtz, JBJS 2007
PREVENTION STRATEGIES - CRITICAL

- Perioperative Antibiotics
- Pre Op Decolonization Protocols
- Chlorhexidine Wipes
- OR Traffic Reduction
- Laminar Flow
- Occlusive Post Op Dressings

PATIENT OPTIMIZATION
PATIENT OPTIMIZATION - CRITICAL

Modifiable Risk Factors

• Hgb A1C < 8
• BMI < 40
• Albumin > 3.5
• Smoking Cessation
MSIS INFECTION CRITERIA

• Sinus tract communicating with the prosthesis or Positive Culture on 2 separate tissues or fluid samples or

• Three of the following 5 criteria exist
  • Sedrate > 30 + CRP>10
  • Synovial WBC > 2000
  • Synovial PMN’s >75%
  • One positive culture
  • > 5 Neutrophils in 5 high power histologic fields
SYNOVIAL BIOMARKERS

- Alpha Defensin
- Leukocyte Esterase
- Synovial CRP
- IL-6
- Next Generation Sequencing

- Helpful in culture negative infections
TREATMENT OPTIONS

• I & D & Poly Exchange

• 2 Stage Re-implantation

• 1 Stage Re-implantation
Periprosthetic Knee Sepsis
The Role of Irrigation and Debridement

MARK B. HARTMAN, M.D., THOMAS K. FEHRING, M.D.,
LINDA JORDAN, M.S., AND H. JAMES NORTON, PH.D.

61 % Reinfection Rate

Failure of Irrigation and Débridement for Early Postoperative Periprosthetic Infection

Thomas K. Fehring MD, Susan M. Odum MEd, Keith R. Berend MD,
William A. Jiranek MD, Javad Parvizi MD, Kevin J. Bozic MD,
Craig J. Della Valle MD, Terence J. Gloe MD

64 % Reinfection rate

Clin Orthop Rel Res 471, 2013
Irrigation and Debridement for Periprosthetic Infections
Does the Organism Matter?

Susan M. Odum, MEd.* Thomas K. Fehring, MD,†† Adolph V. Lombardi, MD,§
Ben M. Zmistowski, BS,‖ Nicholas M. Brown, BS,¶ Jeffrey T. Luna, MD,#
Keith A. Fehring, MD,** and Erik N. Hansen, MD††† and The Periprosthetic Infection Consortium

Strep 71% failure all other organisms 67%

J Arthroplasty, Sept 2011

The Fate of Acute Methicillin-Resistant Staphylococcus aureus Periprosthetic Knee Infections Treated by Open Debridement and Retention of Components

Thomas Bradbury, MD,* Thomas K. Fehring, MD,† Michael Taunton, MD,‡
Arlen Hanssen, MD,‡ Khalid Azzam, MD,‡ Javad Parvizi, MD,§
and Susan M. Odum, MEd‖

84 % Reinfection Rate

J Arthroplasty, Sept 2009
SERIAL DEBRIDEMENT LITERATURE

Estes, et al., CORR 2010

- 2 stage debridement with beads between stages
- 2 perioperative
- 18 acute hematogenous
- 18/20 successful

Mont, et al., J Arthroplasty, 1997

- 10 acute perioperative infections
  7/10 - 2 or 3 debridements
- All successful
THE PROBLEM    BIOFILM

• Dooms I & D Poly Exchange Results

• Bacterial colonies attach to the implant

• Secrete a protective matrix that protects the bacteria from external threats such as antibiotics or the immune system

• Once mature they shed free planktonic bacteria which start new colonies on the implant

• Antibiotics can only kill the free planktonic bacteria
2 STAGE RE-IMPLANTATION

The Chitrnanjan Ranawat Award
Fate of Two-stage Reimplantation After Failed Irrigation and Débridement for Periprosthetic Knee Infection

J. Christopher Sherrell MD, Thomas K. Fehring MD, Susan Odum MEd,
Erik Hansen MD, Benjamin Zmistowski BS, Anne Dennos BS,
Niraj Kalore MD, the Periprosthetic Infection Consortium

30% Reinfection rate

Two-Stage Reimplantation for Periprosthetic Knee Infection Involving Resistant Organisms

By Yogesh Mittal, MD, Thomas K. Fehring, MD, Arlen Hanssen, MD,
Camelia Marculescu, MD, Susan M. Odum, MEd, and Douglas Osmon, MD

86% Success rate

Clin Orthop Relat Res January 2011

1 STAGE RE-IMPLANTATION

• One Stage vs. Two Stage- Controversial
  Implant extraction only removes
  Implant related Biofilm

• Soft tissue Biofilm must also be removed through meticulous debridement

? Can local Biofilm attach to a newly implanted prosthesis?
**EUROPEAN ONE STAGE STUDIES**

- 70 patients minimum 9 year f/u
- Radical resection of bone
- Hinged implants used exclusively - 93% infection free
- 16% lost to f/u
- 16% loose implants

Clinical Ortho Relat Res 474; 2016
100% Success rate
11 Periprosthetic Hip Infections
28 Periprosthetic Knee infections
5 year f/u
Exclusion criteria
- Significant comorbidities
- Resistant organisms
- Presence of sinus tract
- Peripheral Vascular disease
ONE STAGE VS. 2 STAGE WHICH IS BEST?

• One Stage data encouraging but difficult to interpret due to limited numbers, organism exclusion & comorbid patient exclusion

• Two Stage is the gold standard in U.S. but the reinfection rate is closer to 80% than the 90% often quoted

• Patient convenience & Economic ramifications of 2 Stage Demand reevaluation
• Nationwide inpatient sample study
• Annual cost in 2009 - 566 million
• Projected to exceed 1.62 Billion by 2020
• Gold standard in U.S- 2 Stage

Do health economics mandate an investigation concerning 1 Stage?
OREF SPONORED STUDY

- Prospective randomized multicenter study One stage vs. Two stage treatment for Periprosthetic hip & knee infections

<table>
<thead>
<tr>
<th>Initial Sites</th>
<th>Additional Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>OrthoCarolina</td>
<td>USC</td>
</tr>
<tr>
<td>Rush</td>
<td>UCSF</td>
</tr>
<tr>
<td>Rothman</td>
<td>Emory</td>
</tr>
<tr>
<td>Cleveland Clinic</td>
<td>Ochsner Clinic</td>
</tr>
<tr>
<td>HSS</td>
<td>UT Chattanooga</td>
</tr>
<tr>
<td></td>
<td>Univ. of Michigan</td>
</tr>
<tr>
<td></td>
<td>Univ. of Iowa</td>
</tr>
</tbody>
</table>

T.TFEHRING P.I.
ONE STAGE vs. 2 STAGE STUDY

Inclusion Criteria

• Primary surgery
• Infection/MSIS criteria
• Known organism
• Resistant organisms
• Previous I & D
• Reprep/Re-drape Protocol
• All host classified/ MSIS criteria
• 350 patients

Exclusion Criteria

• Fungal Infection
• Immunosuppressed patients
• Extensive soft tissue defect
• Revision surgery
ONE STAGE VS. TWO STAGE

Go with the status quo or an unknown quantity with significant risk but a possible upside

It’s time to settle this controversy
WHAT DO WE NEED?

A prospective randomized multicenter study excluding only fungal organisms and immunosuppressed patients.
ONE STAGE VS. TWO STAGE

WE'LL LET YOU KNOW
I would consider doing a One Stage Preimplantation for a Periprosthetic Hip or Knee Infection.

1. If the organism was a sensitive staph or strep in a healthy patient.
2. In an elderly infirmed patient with multiple medical problems regardless of organism
3. In any patient even one with a resistant organism if not immunosuppressed
4. #1 & #2 only
5. Never I would prefer a 2 Stage Approach
Thank You