Risk factors of periprosthetic infection
and my experience of how to prevent an infection

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"Postoperative infection is the saddest of all complications… »

Sir John Charnley
Risk Factors Associated with Deep Surgical Site Infections After Primary Total Knee Arthroplasty

An Analysis of 56,216 Knees

Risk Factors for Infection After Knee Arthroplasty

A Register-Based Analysis of 43,149 Cases

By Esa Jämsen, BM, Heini Huhtala, MSc, Timo Puolakka, MD, PhD, and Teemu Moilanen, MD, PhD

Investigation performed at Coxa, Hospital for Joint Replacement, Tampere, Finland

Preventing Infection in Total Joint Arthroplasty

Wadih Y. Matar, S. Mehdi Jafari, Camilo Restrepo, Matthew Austin, James J. Purtill and Javad Parvizi


Review article: Risk factors of infection following total knee arthroplasty
Patient-specific

The “systemic” risk factors:

- Diabetes
- Male gender
- Rheumatoid arthritis
- ASA score 3 or greater
- Recent weight loss
- Advanced age
- Debilitation
- Oral steroids
- Disseminated cancer
- Admission from a healthcare facility

Patient Optimization

*Modifiable* Risk Factors

- 1. Diabetes
- 2. Obesity
- 3. Malnutrition
- 4. Smoking
- 5. Mental health
- 6. MRSA Screening
It is our consensus opinion that consideration should be given to delaying total joint arthroplasty in a patient with a **BMI > 40**, especially when associated with other co-morbid conditions, such as poorly controlled diabetes or malnutrition.
Mechanical / Biological

Real problem is biology: Fat degradation products (Leptine, Adiponectine)
→ low grad inflammation status
Superficial wound infection

- Friedman et al, CORR, 2013
  - Obese patients → increased infections (surgical and extra-surgical sites)

- Huddleston et al, CORR, 2012
  - Obesity increases adverse events (OR = 1.20)
Deep periprosthetic Joint Infection

- **Dowsey et al, CORR, 2009**
  - Morbid Obesity (> 40 kg/m²) → Increase PJI by 9X!

- **Malinzak et al, JOA, 2012**
  - Super Obese (> 50 kg/m²) → Increase PJI by 21X!
REINFECTION

- Matt Abdel – HIP Meeting (Toulouse) 2014

- Non-obese: 3%
- Morbidly Obese: 32%
  - $p < 0.001$
  - HR 18
Current smoking

**Systemic effects of smoking and Nicotine**

Local Tissue Hypoxia:
- micro-vascular constriction
- Increase carboxyhemoglobin

Decreased collagen production
- Wound healing

Decreased T cell function
- Infection

Smoking cessation 4-8 weeks prior surgery
Decrease complications but not normalize

Cochrane Database 2005 – Moeller Lancet 2002
Nasal carriage of staphylococcus Aureus

Preop screening MRSA and MSSA

30% population MSSA carriers
4% MRSA carriers

Goal:
Decrease the incidence of postoperative S aureus SS by eliminating S aureus nasal carriage from the patient prior to surgery

Springer 2014 – Metanalysis 16 studies / 56711 patients

Nasal decolonization resulted in 54,6% decrease in the risk of SSI compared to controls
Hematocrit < 36

Modifiable

Patient blood management in Europe
A. Shander¹, H. Van Aken², M. J. Colomina³, H. Gombotz⁴, A. Hofmann⁵, R. Krauspe⁶, T. Richards⁸, R. Slappendel⁹ and D. R. Spahn¹⁰

Allogenic blood transfusion
Blood Loss > 1L

Pulido et al. CORR 2008
Previous knee surgery

Septic history
How to prevent an infection?

Rule n°1

Patient selection
Procedure-specific
Suboptimal prophylactic antibiotic

- Timing
- Dose
- Antibiotic

<table>
<thead>
<tr>
<th>Individuals for Whom Vancomycin Should Be Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients colonized with MRSA* (detected during screening)</td>
</tr>
<tr>
<td>Patients with history of infection with MRSA*</td>
</tr>
<tr>
<td>Institutionalized patients (nursing home, dialysis, etc.)</td>
</tr>
<tr>
<td>Health-care professionals</td>
</tr>
<tr>
<td>Patients with proven β-lactam allergy</td>
</tr>
</tbody>
</table>

“\It is not a good idea for humans to develop resistance to antibiotics.\”
Nb of surgeons participating in procedure
Longer procedure time

>210 min as compared with <120 min

Ong et al. JOA 2009
Prolonged wound drainage


The Use of Erythromycin and Colistin-Loaded Cement in Total Knee Arthroplasty Does Not Reduce the Incidence of Infection

A Prospective Randomized Study in 3000 Knees

TABLE IV Multivariate Model of Risk Factors for Deep Infection*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (M)</td>
<td>2.11 (1.10-4.04)</td>
<td>0.023</td>
</tr>
<tr>
<td>Operating time of &gt;125 min</td>
<td>2.67 (1.28-5.57)</td>
<td>0.009</td>
</tr>
</tbody>
</table>

*Calibration (Hosmer-Lemeshow test) (p = 0.177). Discrimination power area under the curve was 0.624 (95% CI, 0.532-0.716). CI = confidence interval.
Surgical site infection after total knee arthroplasty: a monocenter analysis of 923 first-intention implantations.

Debarge R1, Nicolle MC, Pinaroli A, Ait Si Selmi T, Neyret P.
My experience?

1995 – 2015

Perioperative infection Database

n = 25,000

Lyon metropolis
2,000,000 inhabitants

Rhône-Alpes Auvergne region
7,500,000 inhabitants
Follow up ++

Procedures

SSI
PREOPERATIVE

« Host optimization »

- Improve control of glucose and ulcers in diabetics
- Control nidus of infection (dental clearance, etc.)
- Malnutrition: improve nutritional status
- Obesity: decrease weight and improve nutritional status
- Skin (psoriasis, eczema, ulcers)
- Vascular insufficiency
- Smoking cessation
- MRSA† decolonization
PREOPERATIVE

Day of Surgery

– Surgical site shaving
– Skin decontamination
– Betadine shower
– Chlorhexidine wipes/showers
– Prophylactic antibiotics
INTRAOPERATIVE

*Surgical factors*
- Prophylactic antibiotics
- Skin preparation
- Draping
- Changing scalpel blades
- Bleeding control
- Skin closure
- Dressing

*Surgical team*
- Gloves

*Surgical environment*
- Operating-room traffic
- Airflow
POSTOPERATIVE

• Immediate
  – Prophylactic antibiotics
  – Dealing with persistent draining wounds

• Late
  – Antibiotics before dental, genitourinary, and gastrointestinal procedures
Take home message

INFECTION PREVENTION

Be aware of risk factors
Patient information ++
Patient optimization
Perfect control of your surgical environment
Follow up +++
Thank You

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