

Conclusion. RD PJIs are more likely to be culture-negative than OA PJIs. Prior PJI, histopathology and better outcomes suggest biologic differences that should be explored further.

Figure 1 The Kaplan-Meier curve representing implant survivorship after prosthetic joint infection treatment for rheumatic disease(RD) was 66% at 1 year for culture negative (red) and 47% for culture positive (blue), $p=0.163$.

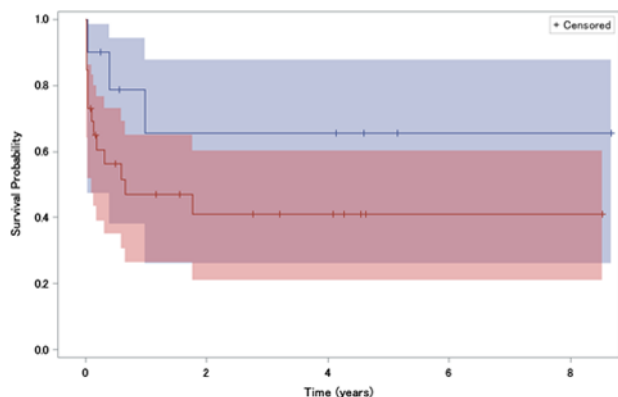


Table 1 Patient characteristics in the rheumatic disease (RD) prosthetic joint infection (PJI) group. (culture negative, CP; culture negative, CN; I&D, irrigation and debridement)

| | Total RD (N=36) | CN-RD (N=10) | CP-RD (N=26) | p-value |
|----------------------|-----------------|---------------|---------------|---------|
| Age | 58.55 (11.41) | 59.04 (10.21) | 58.35 (12.02) | 0.986 |
| Body mass index | 26.81 (11.48) | 25.88 (9.81) | 27.16 (12.23) | 0.697 |
| Sex | | | | 1.000 |
| Female | 28 (77.78) | 8 (80) | 20 (76.92) | |
| Male | 8 (22.22) | 2 (20) | 6 (23.08) | |
| Joint | | | | 0.285 |
| Knee | 16 (44.44) | 6 (60) | 10 (38.46) | |
| Hip | 20 (55.56) | 4 (40) | 16 (61.54) | |
| History of Smoking | 4 (11.11) | 1 (10) | 3 (11.54) | 1.000 |
| Diabetes | 5 (13.89) | 0 (0) | 5 (19.23) | 0.293 |
| History of prior PJI | 2 (5.56) | 2 (20) | 0 (0) | 0.071 |
| Surgical Therapy | | | | 0.791 |
| One Stage Exchange | 1 (2.78) | 0 (0) | 1 (3.85) | |
| Two Stage Exchange | 18 (50) | 6 (60) | 12 (46.15) | |
| I&D | 17 (37.23) | 4 (40) | 13 (50) | |

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384. Denosumab-Related Osteonecrosis of the Jaw: an Emergent and Potentially Complex Bone and Joint Infection

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Background. Osteonecrosis of the jaw is a known complication of antiresorptive treatment, like bisphosphonate. More recently, denosumab was validated as a treatment in the osteoporosis and bone metastasis. Its mechanism is different from bisphosphonate but induces also a decrease of bone resorption and a risk of osteonecrosis of the jaw. In case of treatment failure by a dental surgeon or in complex cases, patients could be addressed to a bone and joint infection (BJI) reference center. The aim of this study was to analyze microbiology, as well as surgical and medical care of patients who present denosumab-related osteonecrosis of the jaw (DRONJ) and who were treated in a bone and joint reference center.

Methods. All patients managed in our BJI reference center between January 2013 and December 2018 for a DRONJ were included in our retrospective observational monocentric cohort.

Results. Twelve patients (median age 71; ratio M/W 0.7) with a DRONJ (metastatic cancer, $n = 10$ (83%)) in grade 3 ($n = 5$), 2 ($n = 4$), 1 ($n = 3$) were included. Only 3 patients (25%) had a dental health control before initiating the treatment by denosumab and 7 patients (58%) had a dental surgical procedure done before the DRONJ. Eleven patients had a bone exposure, treated at least with a scaling and mucosal closure at the same time. All infections with bacterial cultures ($n = 11$ (91%)) were polymicrobial, including 8 (72%) with *Streptococcus* spp; 8 (72%) with anaerobias including 2 (18%) with *Actinomyces*; 5 (45%) with *Staphylococcus* spp; 5 (45%) with

enterobacteria; 3 (27%) with *Candida* spp; 2 (17%) with a non-fermentative Gram-negative bacilli and 7 (64%) with others bacteria. All patients ($n = 12$) received a betalactam, 8 (66%) a lincosamide or a synergist, 5 (41%) an antifungal, 5 (41%) metronidazole, 4 (33%) a fluoroquinolone, 3 (25%) a glycopeptide and 2 (17%) other antibiotics. The median follow-up was 6 months. Eight patients were cured after a medico-surgical care and a median duration of antibiotics of 97 days (including 28.5 days in intravenous). 2 patients required a suppressive antibiotic treatment, 1 relapsed at a distance of the treatment and 1 died from some other causes.

Conclusion. DRONJ is a potential complex BJI, for which some patients could benefit from medical care in a BJI reference center.

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385. Arthroscopic vs. Open Surgery for Septic Arthritis of the Knee: A Systematic Review and Meta-Analysis

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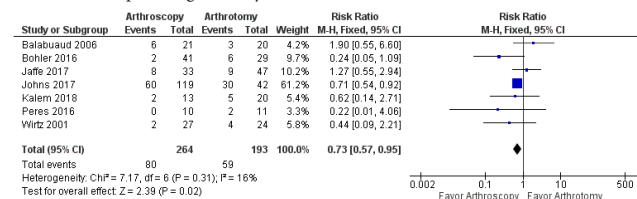
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Background. Septic arthritis is a joint-threatening and life-threatening infection, with the knee representing the most frequently involved joint. There is no definitive treatment algorithm for the management of this condition, which typically includes surgical debridement to decompress the joint, followed by organism-specific intravenous antibiotics.

Methods. Search Methods. MEDLINE (1965–2018), SCOPUS (1973–2018), The COCHRANE Library (2006–2017), EMBASE (1974–2018), reference lists, and scientific meetings were searched for relevant studies on the treatment of native knee septic arthritis by three independent reviewers. No language restrictions were used. Selection criteria included all studies reporting on native knee septic arthritis in adults treated with arthroscopy and open arthrotomy with irrigation and debridement. Data Collection and Analysis Studies were identified, subjected to inclusion and exclusion criteria, and reviewed by three independent reviewers. Patient characteristics, interventions, and outcomes were extracted, and the trials were rated for quality based on established criteria. A meta-analysis was conducted for the primary outcome, reoperation occurring after arthroscopic vs. open arthrotomy irrigation and debridement for the treatment of septic arthritis. We used a qualitative analysis for secondary outcomes physical function and hospital length of stay.

Results. From 624 abstracts, eight trials met inclusion criteria, one randomized controlled trial and seven retrospective cohorts. Quantitative meta-analysis showed arthroscopic irrigation and debridement resulted in fewer reoperations compared with open arthrotomy (RR = 0.76; 95% CI 0.59–0.97, $P = 0.03$, $I^2 = 24%$), Figure 1. A qualitative summary of seven included studies assessing physical function showed arthroscopic debridement results in improved functional outcomes and range of motion compared with open arthrotomy. Based on four trials, qualitative summary demonstrated that arthroscopic debridement results in decreased hospital length of stay compared with open arthrotomy.

Conclusion. Arthroscopic irrigation and debridement is favored over open arthrotomy with regard to lower rates of reoperation, improved functional outcomes, and shorter hospital length of stay.



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386. Blue Light Reduces Cutibacterium (Propionibacterium) Acnes Bacterial Burden: Orthopedic Shoulder Infection Prevention Strategy?

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Background. *Cutibacterium acnes* (*C. acnes*) is a common shoulder periprosthetic joint infection (PJI). Blue light (BL) is effectively used in the dermatologic clinical setting against acne vulgaris caused by *C. acnes*. Photodynamic therapy (PDT) is the use of light source and photosensitizer (PS) to enhance antimicrobial activity. We studied the effect of PDT using BL and PS *in vitro* on shoulder PJI isolates of *C. acnes*.

Methods. 19 strains were grown in thioglycollate medium and diluted in sterile normal saline (NS) to a turbidity of 0.5 McFarland standard; OD₆₀₀ of 0.1 to 0.15. 250 µL with PS added were placed in 96-well plates at 37°C, exposed to BL (415 nm) placed 1 cm above for 0 to 60 minutes at 15-minute intervals. Susceptibility to BL alone, and BL with PSs such as riboflavin (R, Vit B2), fluorescein (F) or demeclocycline (tetracycline antibiotic, "D") were studied. After serial 10-fold dilution with NS, 3 µL of each well were spotted onto Brucella Blood Agar plates and incubated anaerobically

for 48 hours. Eradication was defined as below the limit of detection. Definitions include *Sensitive* (S) if 3-log decrease in bacterial density or eradication at any time point, *Weakly Sensitive* (WS) with 1- to 3-log decrease and *Resistant* (R) with no decrease.

Results. Based on BL alone, ($n = 19$). 68% strains were S, 32% were resistant. BL + R (10 µg/mL) effect in 25% ($n = 3$) and exerted a protective effect against 33% ($n = 4$). BL + F (1 µg/mL) potentiated in 67%. BL + D (0.1–1.5 µg/mL) in 83% of strains tested. The most resistant strain was eradicated using BL + D at an increased concentration of demeclocycline (2.5 µg/mL).

Conclusion. F and D enhanced the potential for eradication compared with BL exposure alone. R was a photo-protectant to BL for select strains. Prior studies have hypothesized endogenous intracellular porphyrins excited by BL causing energy transfer and production of highly cytotoxic reactive oxygen species causing bacterial death. Future clinical research evaluating the use of preoperative PS and surgical site exposure to BL as a preventative PJI strategy are needed. Our research shows that BL with the addition of PS significantly reduces the bacterial burden of clinically relevant PJI shoulder isolates of *C. acnes* in an *in vitro* model.

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387. A Rare Manifestation of a Common Disease: Tenosynovitis Associated with *Clostridium difficile*: Case Report and Review of Literature

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Background. Reactive arthritis typically develops following enteric or genitourinary infection. The most common offending pathogens are *Chlamydia*, *Salmonella*, *Shigella*, *Yersinia* and *Campylobacter*. We report a unique case of a patient with tenosynovitis attributed to *Clostridium difficile* (*C. difficile*), and review of the literature.

Methods. We searched PubMed for “reactive arthritis” and “*C. difficile*” and found 53 cases. Two additional cases were excluded as they were published in French.

Results. An 18-year-old healthy male presented with nine days of abdominal pain and diarrhea, and two days of pain and swelling of bilateral fingers with an erythematous/eczymotic rash over the second and third digits. Four weeks prior to symptom onset he received antibiotics for streptococcal pharyngitis. On presentation he had diffuse abdominal tenderness and edema of the PIP/DIP joints with tenderness throughout the phalangeal soft tissue, consistent with tenosynovitis. He had a leukocyte count of 33.0 thou/ µL and C-reactive protein of 12.0 mg/dL (normal < 1.0 mg/dL). *C. difficile* toxin PCR was positive, toxin EIA was negative. CT scan of the abdomen/pelvis demonstrated mural thickening consistent with extensive severe colitis. He received 14 days of oral vancomycin, with complete symptom resolution, including the tenosynovitis. Our literature review revealed 22.6% (12/53) of cases had involvement of hands, although all also had involvement of other joints. Our patient’s isolated tenosynovitis of bilateral hands is unique, and has only been reported once prior to our knowledge. Literature suggests treatment of the underlying *C. difficile* infection should result in rapid clinical improvement of tenosynovitis symptoms, as in our patient.

Conclusion. *C. difficile* continues to pose a significant threat to health and burden on the healthcare system. The association of reactive arthritis and *C. difficile* was first reported in 1976, with only 53 subsequent cases reported. Reactive arthritis classically presents as asymmetrical oligo- or polyarthritis involving lower extremities or large joints. Our case demonstrates isolated tenosynovitis of the hands may also be a possible presentation. Given the continued rise of *C. difficile*, it is imperative that this pathogen is considered in such cases.

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388. Spinal Implant Infections Treated with Debridement and Hardware Retention

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Background. Surgical site infections following spinal surgery affect 0.3 to 20% of patients. The longer the infection, the greater the chance of antibiotic treatment failure due to the establishment of mature microbial biofilm on the hardware, requiring its removal for infection eradication.

Methods. Retrospective cohort of patients with microbiologically confirmed SII following spinal surgery treated with debridement and retention. SII was defined as the presence of clinical signs of deep surgical site infection with 2 or more positive culture results of tissue surrounding the implant taken during surgical debridement; or from CT guided biopsy. Inclusion criteria: adults with a 1^o episode of microbiological confirmed SII diagnosed from 2008 to 2017 with >2 years of follow-up, treated with implant retention. Definitions Early-onset infection (EOI): infection < 1 month following implant placement. Late onset infection (LOI): between 30 days and 1 year after implant placement. Delayed onset infection (DOI): >1 year of implant placement. Statistical analysis made in Graph Pad Prism 5.0.

Results. We analyzed 19 patients with SII treated with hardware retention. Mean age was 54 (21–70) years, 63% were female. Comorbidities, clinical manifestations and motive for surgery are in Table 1 and Figure 1. Hardware material used was titanium 15(79%) and steel 4(21%). In addition to the hardware, 11 patients (57.9%) underwent

bone grafting, 4 experienced treatment failure (4/11 = 36.4%); 2 patients had nonmetallic material inserted (carbon polymer), the 2 patients experienced failure. 16 patients (84.2%) had EOI, 2 (10.5%) LOI, 1 (5.3%) DOI. Failure requiring implant removal was observed in 26.3% ($n = 5$), 2 of the cases were EOI, 2 LOI and 1 DOI. Bacterial characteristics of patients are shown in Table 2. 47.4% of patients required more than one debridement (Figure 2). In the linear regression model, treatment failure was associated with bone grafting ($P = 0.04$) and the use of carbon polymer materials ($P = 0.007$).

Conclusion. Treatment of SII with debridement plus antimicrobials treatment is acceptable, with a rate failure of 26%. In LOI and DOI spinal implant retention is more prone to fail. Bone grafting and the presence of polymers seem to be associated with treatment failure of conservative strategies.

Table 1. Comorbidities

| Characteristics | Value | N (%) |
|---------------------------|-------|------------|
| Diabetes | | 4(21.1%) |
| Smoking | | 2(10.5%) |
| Liver Diseases | | 0 |
| Steroid use | | 2(10.5%) |
| Hypoalbuminemia | | 2(10.5%) |
| Immunosuppressive therapy | | 3(15.8%) |
| Systemic malignancy | | 4(21.1%) |
| Haematological malignancy | | 2(10.5%) |
| Radiotherapy | | 1(5.3%) |
| ASA score 1-2 | | 11 (57.9%) |
| ASA score 3–4 | | 8 (42.1%) |

Table 2. Bacterial characteristics of patients with spinal implant infection included in the study (n = 19)

| Early | |
|---|-----------|
| MSSA | 4 (21%) |
| MSCNS | 2 (10.5%) |
| MRCNS | 1 (5.3%) |
| <i>Enterococcus</i> spp. | 1 (5.3%) |
| <i>Escherichia coli</i> | 1 (5.3%) |
| <i>Proteus</i> spp. | 1 (5.3%) |
| <i>Stenotrophomonas maltophilia</i> | 1 (5.3%) |
| <i>Citrobacter rodentium</i> | 1 (5.3%) |
| <i>Enterobacter</i> spp. | 1 (5.5%) |
| Polymicrobial | |
| MRCNS + MSCNS + <i>Pseudomonas aeruginosa</i> | 1 (5.3%) |
| MRCNS + <i>Streptococcus viridians</i> | 1 (5.3%) |
| MRCNS + <i>Enterococcus faecium</i> | 1 (5.3%) |
| Late | |
| MSSA | 2 (10%) |
| Delayed | |
| <i>Proteus</i> spp. | 1 (5.3%) |

MSSA: Methicillin-susceptible *Staphylococcus aureus*, MSCNS: Methicillin-Susceptible Coagulase-Negative *Staphylococcus*, MRCNS: Methicillin-Resistant Coagulase-Negative *Staphylococcus*

Figure 1.

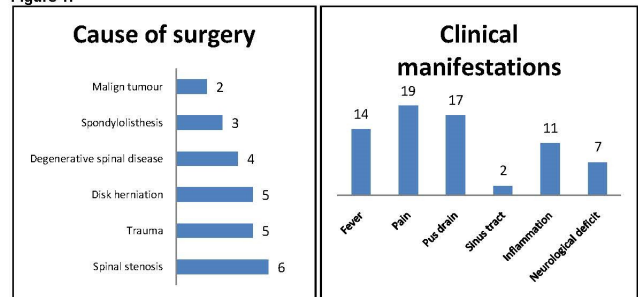
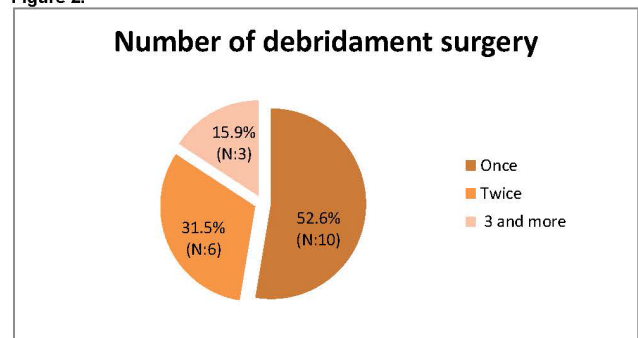


Figure 2.



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