Adjuncts to Prevent Infection: Is Anything Ready for Prime Time?

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Despite the evolution of strategies related to prophylaxis measures in the hospital and operating room (OR) environment, infection continues to be the most devastated complication post fracture fixation. Administration of antibiotics, fixation of fractures in lamina flow equipped OR, skin preparation/disinfection measures, appropriate timing of intervention in the so called ‘fractures at risk’ (proximal tibia, distal tibia, etc), optimization of comorbidities (i.e., diabetes) in immunocompromised patients, correct debridement/irrigation and prompt soft tissue closure in open fractures are some of the established measures that have contributed in the advances made.

During the past decade research is ongoing to identify other areas during the pathway of fracture fixation where potential interventions could further reduce the risk of infection. These areas include the surface topography of implants, vehicles of delivery of local antibiotics with specific elution characteristics and wound dressings capable of delivering incisional drainage.

The difference in infection susceptibility between titanium and Stainless Steel (SS) implants, has been a topic of great interest to the scientific community. Data collected from animal studies found that titanium is superior to Electropolished Stainless Steel (EPSS) with regard to infection susceptibility (this was attributed to superior biocompatibility of titanium and the fact that fibrous capsules could be developed over EPSS implants). Recently, in order to investigate further the role of implant material and surface topography, different type of implants were tested in a rabbit humeral osteotomy model. Standard Electropolished Stainless Steel (EPSS), standard titanium (Ti-S), roughened stainless steel (RSS) and surface polished
titanium (Ti-P) plates were assessed. Each rabbit received one of three Staphylococcus aureus inocula, intended at determining the infection rate at a low, medium and high dose of bacteria. Quantification of bacteria on the implant and in the surrounding tissues as well as determination of the infectious dose 50 (ID50) were the outcome measures. No significant differences were seen in susceptibility to infection when comparing titanium and steel implants with conventional or modified topographies. However, the authors observed that the Ti-S plate had a lower bacterial load compared to both EPSS and RSS, but only when using a high bacterial inoculum. Based on this observation they speculated that the material (or its surface) may not influence the infection risk, but rather the infection severity.³

The concept of local delivery of antibiotics utilizing different carriers for distribution, in particularly in fractures at risk (ie open fractures), has gained great popularity lately. Impregnated collagen fleeces⁴, antibiotic loaded fast-resorbable hydrogel coatings⁵, injectable gentamicin-loaded thermo-responsive hyaluronic acid derivatives⁶, and mixing antibiotics into VitagelTM tissue sealant⁷ amongst others have been used with relative success in both experiment and clinical trials. However, their routine utilization in the clinical setting has not been forthcoming.

Finally, the impact of prophylactic use of a specific design of negative pressure wound therapy (NPWT) dressing (device) on surgical site complications has been tested in different clinical conditions by a variety of disciplines. A recent meta-analysis revealed a significant reduction in SSI, wound dehiscence, and LOS on the basis of pooled data from 16 studies showing a benefit of the PICO single-use NPWT system compared with standard care in closed surgical incisions.⁸
References


