

Pre-treating PJI with systemic antibiotics decreases tissue and implant bacterial counts: results from an in vivo model

Christina A Chao, Tyler Kim Khilnani¹, Suenghwan Jo², Mathias P G Bostrom¹, Alberto V Carli¹

¹Hospital For Special Surgery, ²Chosun University Hospital

INTRODUCTION:

Periprosthetic joint infection (PJI) is a complication of total joint arthroplasty that typically requires revision surgery for treatment. Systemic antibiotics are usually held prior to surgery to improve yield of intraoperative cultures. However, recent studies suggest that preoperative aspirations have a high concordance with intraoperative cultures, which may allow surgeons to initiate antibiotic treatment earlier. The purpose of the study was to investigate the effect of Pre-surgical systemic antibiotic therapy on the bacterial burden within the periprosthetic space and systemic immune reaction.

METHODS:

PJI was induced with MSSA (Xen36) *S. aureus* in the right knee of 16-week old, female, C57BL6 mice using a previously validated murine model. Mice were randomized to three groups (n=8, each): control; Vanc, receiving systemic vancomycin (110mg/kg, SQ, twice daily); or VancRif receiving vancomycin same as in Vanc group, plus rifampin (12mg/kg dose, IV, once daily). Following 2 weeks of treatment, mice were euthanized and periprosthetic bone, soft tissue and the implant were harvested. Bacterial burden, colony forming units (CFUs), was quantified in soft tissue, tibial bone, and on the implant. Specifically, tissues were homogenized and serially plated for CFUs, while the implant was sonicated and then plated for CFUs. The host immune response was analysed through weighing inguinal and iliac lymph nodes and through measuring serum amyloid A (SAA). Non-parametric pairwise group comparisons of the three outcome measures were performed using a Mann-Whitney U test.

RESULTS:

VancRif, the combined treatment significantly reduced bacterial burden in the periprosthetic soft tissue, bone, and implant compared to control ($p<0.001$) and Vanc alone ($p<0.001$). While not significant, Vanc alone did reduce bacterial load as compared to control. The ipsilateral weight of the iliac lymph nodes was significantly reduced in Vanc and VancRif mice compared to controls ($p<0.001$), as well as in VancRif versus Vanc alone ($p<0.001$). Interestingly, SAA levels did not significantly differ among all groups. During tissue harvesting, minimal purulence was observed in antibiotic treatment groups, unlike controls.

DISCUSSION AND CONCLUSION:

Treating active PJI with vancomycin alone decreases periprosthetic bacterial loads and reduces the local immunological response. This effect is significantly enhanced with the combined rifampin use. These findings could suggest that when culture positive PJI is diagnosed, pre-surgical treatment with antibiotics may decrease immunosuppression and soft tissue infiltration, leading to a better chance of infection cure with subsequent surgical debridement. Histological investigations and repeat experiments involving subsequent surgical treatment are underway.

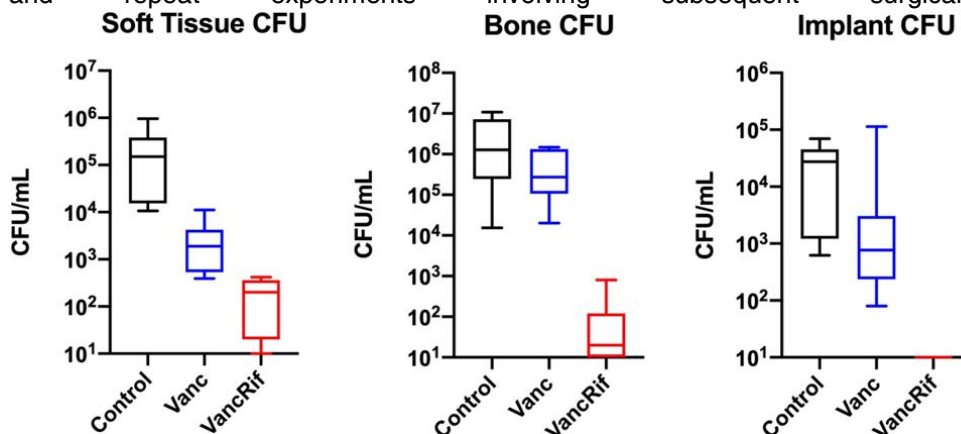


Figure 1. CFU counts on processed soft tissue, bone, and implants. Non-parametric pairwise group comparisons were performed using a Mann-Whitney U test showing significance comparing control-Vanc, ($p<0.001$); control-VancRif, ($p<0.001$); and Vanc-VancRif, ($p<0.001$).