



Paper #54

Bacterial Suture Adherence and Biofilm Formation in an in-Vivo Contaminated Wound Model

Michael R. Morris, MD, Christopher Bergum, BS, Nancy Jackson, **David C. Markel, MD**

Introduction: Bacterial wound infections continue to be problematic for the orthopaedic surgeon. The choice of suture material has drawn scrutiny as a way to possibly reduce wound infection. This study evaluates bacterial adherence to suture materials and tissue reactivity with a bioluminescent in vivo mouse model.

Methods: We utilized a mouse Air Pouch model to simulate a joint environment. Bioluminescent *Staphylococcus aureus* were utilized to create an in vivo contaminated wound model at two amounts (10^6 CFU & 10^8 CFU). Three types of commonly used absorbable suture were evaluated: braided, monofilament and barbed monofilament. Groups of 8 mice had two 1 cm strands of one of the suture types surgically placed into the Air Pouch followed by inoculation of either a high or low amount of the *S. aureus*. Bacterial suture adherence was evaluated with suture culture, a photon-capturing camera system, and scanning electron microscopy (SEM). Tissue reactivity was assessed through histology, RNA expression and protein expression.

Results: The braided suture group with the high amount of *S. aureus* exhibited frank purulence in all 8 mice. A significant difference between the optical density (OD) emitted per millimeter of suture was found between the suture groups with inoculation of high amounts of *S. aureus* ($p < 0.05$). More specifically the braided group demonstrated higher ODs/mm than both the monofilament ($p < 0.005$) and barbed monofilament groups ($p < 0.005$). No difference was appreciated between the monofilament and barbed monofilament groups. SEM demonstrated what appears to be biofilm in all high amount groups with the most robust in the braided suture group.

Conclusion: We believe that this is the first in vivo, contaminated wound model that provides information for the selection of suture material. Braided suture should be avoided when dealing with contaminated wounds. Interestingly, this model demonstrated no difference between the use of monofilament and barbed monofilament sutures in a contaminated wound.
