

Comparing MRSA Biofilm Adherence and Growth Rate on Titanium Versus Stainless Steel Orthopaedic Implants

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Purpose: Implant infections are a critical issue in fracture surgery. Recent evidence suggests titanium’s potential antimicrobial properties in reducing biofilm-forming infections on implants. This study aims to compare MRSA (methicillin-resistant Staphylococcus aureus) biofilm adherence and growth rates on surgical-grade stainless steel and titanium orthopaedic implants in physiologically relevant conditions.

Methods: Sterile stainless steel and titanium orthopaedic washers were inoculated with bioluminescent MRSA and cultured in dynamic conditions using a macrofluidic device. Biofilm biovolume was determined by bioluminescence and validated through sonication and plating for CFU (colony-forming unit) values. Biovolume comparison of stainless steel and titanium washers used matched pairs.

Results: The relative change of MRSA biofilm biovolume on stainless steel was higher than that of titanium washers over 96 hours with significance at 24 and 96 hours, but not at 48 or 72 hours (Fig. 1b). Stainless steel washers showed a higher average MRSA biofilm biovolume than titanium, although not statistically significant (Fig. 1b).

Conclusion: In this study, titanium may be associated with reduced relative growth rate of MRSA biofilm, compared to stainless steel using surgical-grade implants. Additionally, titanium may exhibit reduced initial adherence of biofilm-forming MRSA. However, additional experiments are required to confirm these findings. These results indicate that titanium may be a preferable material, particularly when treating injuries at high risk for infection.

