

Retained cement in orthopedic surgical trays: should we worry about infection risk? An investigation of autoclave efficacy against contaminated surgical materials

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INTRODUCTION: Retained polymethylmethacrylate (PMMA) debris in surgical instrument trays is a rare, but disquieting situation for the arthroplasty surgeon. Although retained debris could be considered to be sterile after autoclaving, there is no peer-reviewed literature to support this assumption. This uncertainty and subsequent fear of contamination from this bioburden often leads to operating room personnel turning over entire surgical tables and opening new surgical instruments, which consumes time and burdens a hospital's sterilization infrastructure. Consequently, the purpose of the current study was to determine if retained, heavily contaminated PMMA in surgical trays could be effectively sterilized through different types of autoclave protocols utilized clinically.

METHODS:

MSSA biofilm was grown on identically sized PMMA coupons for 72-hour duration. Following incubation, coupons were rinsed with PBS to remove planktonic bacteria, then exposed to three commonly used sterilization protocols. Cobalt-Chrome (CC) coupons were included in the same tray, replicating instruments in proximity to retained PMMA. Autoclave protocols included: 1.) Single Instrument Flash protocol: Pre-vac, 270° F, 10 min exposure, 1 min drying, 2.) One Tray OR protocol: Pre-vac, 270° F, 4 min exposure, 1 min drying, and 3.) Standard Post-Operative protocol: Pre-vac, 270° F, 10 min exposure, 60 min drying. A separate control group did not undergo any autoclaving. Coupons were then sonicated for 30 minutes in tryptic soy broth and plated to later count CFUs. Experiments were performed in quadruplicate.

RESULTS:

CFU counts revealed that each sterilization protocol was effective in completely eradicating culturable *S. aureus* (72 hr biofilm) from PMMA coupons. Control coupons showed significant contamination with high CFU counts in the range of 10⁶ CFU/mL. It was also shown that cross-contamination between the PMMA and CC coupons did not occur. CFU counts across all autoclaved PMMA and CC were zero, confirming clinical efficacy on orthopaedic cement sterilized in surgical trays.

DISCUSSION AND CONCLUSION: Our findings demonstrate that heavily contaminated PMMA and exposed metal in surgical trays can be effectively sterilized through several different autoclaving protocols. Clinicians should feel confident in the efficacy of autoclave protocols in removing bacteria and its associated biofilm from orthopaedic materials.