

Intrawound Vancomycin Powder Reduces Bacterial Load in Contaminated Open Fracture Model

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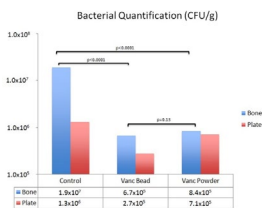
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Purpose: Intrawound application of vancomycin powder has shown to decrease surgical site infection rates in both cardiac and spine surgery in retrospective studies. Polymethylmethacrylate (PMMA) beads infused with antibiotic powder have been used in the treatment of open fractures to decrease rates of infection, but require removal at a later time. The purpose of this study was to compare the effectiveness of both vancomycin powder and antibiotic bead placement to irrigation and debridement alone in prevention of infection in a contaminated open fracture model in rats.

Methods: In a previously described model of contaminated open fractures, 45 400-g Sprague-Dawley rats had simulated open fractures created, stabilized, and contaminated with 10⁵ CFU of *Staphylococcus aureus*. They were then treated 6 hours later with 3 interventions: irrigation and debridement alone (control group), irrigation and debridement with placement of PMMA beads containing vancomycin and tobramycin powders (antibiotic bead group), and irrigation and debridement with placement of 10-mg intrawound vancomycin powder (powder group). Rats were allowed to recover and then 14 days later sacrificed for harvest of femurs and plates. Femurs and plates were both incubated overnight and bacterial colonies were counted in each group for comparison.

Results: Specimens taken from control and powder groups showed bacterial growth in 30 of 30 samples. Specimens from the bead group showed growth in 26 of 30 samples (P = 0.48). Quantitative counts of bacteria in bone showed significantly reduced growth in both bead (6.7 × 10⁵) and powder (8.4 × 10⁵) groups when compared to controls (1.9 × 10⁷); P < 0.0001. Quantitative counts of bacteria in plates showed significantly reduced growth in both bead (2.7 × 10⁵) and powder (7.1 × 10⁵) groups when compared to controls (1.3 × 10⁶) (P < 0.0003; 0.029). No significant differences were seen in bacterial growth between bead and powder groups for either bones (P = 0.13) or plates (P = 0.065).



Comparison of Groups by Quantitative Cultures of Recovered Bacteria from Bone and Implant Samples (Mann-Whitney Test) and Presence or Absence of Bacteria in Samples (Fisher's Exact Test)

Comparison	Group 1	Group 2	Mann-Whitney Test		Fisher's exact test
			Bone	Plate	
Control	Bead		<0.0001	0.0003	0.483
Control	Powder		<0.0001	0.0294	NA
Bead	Powder		0.13	0.0649	0.483

Conclusion: When compared to irrigation and debridement alone, placement of intrawound vancomycin powder significantly decreased bacterial load in a contaminated open fracture model in rats similar to placing antibiotic beads. This may provide an additional adjuvant treatment that does not require a secondary surgery for bead removal.

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.