

Evaluating the Safety of Intraosseous Regional Vancomycin and Its Effect on Local Tissue Viability: An Experimental Study in a Rat Model

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INTRODUCTION:

Methicillin-resistant *Staphylococcus aureus* (MRSA) presents a significant challenge in arthroplasty. Systemic vancomycin often results in subtherapeutic joint concentrations and systemic toxicity, whereas intraosseous regional administration (IORA) delivers high local levels with reduced systemic exposure. Although effective as prophylaxis, the safety of IORA for treating infection remains uncertain.

METHODS:

Sixteen Wistar rats were inoculated with MRSA in the left knee to induce septic arthritis and randomized into four groups (n = 4 each): (1) control, (2) intraperitoneal vancomycin (IP, 88 mg/kg), (3) IORA 88 mg/kg (IORA 1.0), and (4) IORA 44 mg/kg (IORA 0.5). Treatments were administered daily for 7 days. WBC counts, serum chemistry, cultures, and histologic evaluation of liver, kidney, bone, and cartilage were performed.

RESULTS:

All rats developed elevated WBC levels post-infection. Following treatment, bacterial clearance was achieved in all antibiotic groups. The greatest WBC reduction occurred in IORA 1.0, followed by IORA 0.5 and IP. No evidence of liver or renal injury was observed on blood chemistry or histology. The percentage of non-viable osteocytes was highest in IORA 0.5 (34.4 ± 29.3), followed by IORA 1.0 (32.5 ± 42.1), IP (9.6 ± 2.6), and control (5.5 ± 1.5). The percentage of non-viable chondrocytes was highest in IORA 1.0 (10.5 ± 6.5), followed by IORA 0.5 (9.7 ± 5.7), control (6.9 ± 0.6), and IP (5.9 ± 0.3). Although overall ANOVA was not significant, IORA groups showed significantly greater osteocyte (p = 0.013) and chondrocyte (p = 0.013) non-viability than IP. No difference was observed between IORA doses.

DISCUSSION AND CONCLUSION:

IORA vancomycin demonstrated effective infection control comparable to systemic therapy but resulted in greater local cytotoxicity. These findings raise concerns about tissue viability following IORA and highlight the need for further studies to optimize dosing and evaluate long-term safety.

