# Intraosseous Vancomycin Can Safely Be Used in Total Hip Arthroplasty with Low Systemic Vancomycin Levels and Local Tissue Concentrations of Vancomycin Exceeding Intravenous Levels

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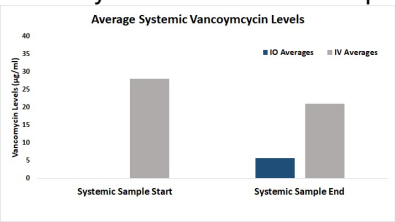
INTRODUCTION: Intraosseous Vancomycin (IOV) has been shown to reduce infection risk in total knee arthroplasty with tourniquet use. As tourniquet use is not possible in total hip arthroplasty (THA), the safety of this technique in the hip is previously unproven. This is a prospective, randomized, single blind study comparing IOV vs. IV vancomycin (IVV) data including serum vancomycin levels, periarticular bone and soft-tissue concentrations, and postoperative Creatinine levels.

METHODS: Institutional Review Board (IRB) approved prospective randomized single-blind study to include 20 patients (10 IVV, 10 IOV) for THA. IVV was given using a standard weight based protocol (15 mg/kg) preop and IOV (500mg in 100ml Normal Saline) injected into the greater trochanter at the start of the procedure. Serum vancomycin levels were obtained at incision and at closure. Tissue vancomycin levels were obtained including a gluteus maximus sample at opening and closing, bone from femoral neck, pulvinar tissue, reamed bone from acetabulum, and bone from rasping of intramedullary femur. These specimens were processed via high-performance liquid chromatography (HPLC). Creatinine levels were measured postop. Patient demographics were comparable (Table 1). Inclusion criteria: primary total hip. Exclusion: no prior infection, no history or evidence of kidney failure, or uncontrolled diabetes. Differences in creatinine levels, patient demographics, and vancomycin concentrations in bone, soft tissue, and serum were calculated using a two-tailed independent-samples t-test. Type I error was set at a p-value of <0.05 for all analyses.

RESULTS: Serum vancomycin concentrations (ug/ml) were statistically lower at incision in the IO group (IO 0 ± 0, IV 27.98 ± 6.11, p< .001) and statistically lower at closure in the IO group (IO 5.75 ± .95, IV 21 ±2.45, p< .0001). (Figure 1) Mean vancomycin concentrations were statistically greater in acetabular reaming in the IOV group (IO; 130.88 ±14.36, IV; 67.97 ± 7.85, p=.001). Remaining tissue levels were; Gluteus Maximus (GM) initial (IO 69.08 ± 15.30, IV 63.77 ± 13.76, p=.80), GM at closing (IO 78.22 ± 10.72, IV 57.14 ± 12.04, p=.22), Bone from femoral head neck (IO 41.45 ± 9.46, IV 20.9 ± 6.94, p=.104), Pulvinar tissue (IO 71.79 ± 18.20, IV 61.58 ± 17.63, p=.69), Intramedullary femur bone (IO 59.39 ± 8.99, IV 33.93 ± 8.49, p=.054). (Figure 2). Creatinine levels were comparable (IO -0.012 ± 0.019, IV -0.007 ± 0.045, p=.93).

DISCUSSION AND CONCLUSION: Intraosseous Vancomycin (IOV) in THA results in significantly lower serum vancomycin levels at initiation and completion of procedure, supporting safe use without tourniquet. Postoperative creatinine levels equivalent to IV vancomycin support the safety profile. All periarticular soft tissue and bone samples revealed greater vancomycin concentrations in the IO group and acetabular bone concentrations were significantly greater. This data supports safety of IOV use in THA, and periarticular vancomycin levels suggest efficacy of IOV. No vancomycin complications occurred in either group.



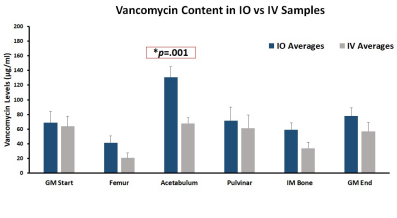




TABLE 1. Patient Demographics

| Independent Variable | IV (n=10) | IO (n=10) | P-Value |
|---|---|---|---|
| Demographics | | | |
| Males (n) | 80.00% | 70.00% | 0.606 |
| Females (n) | 20.00% | 30.00% | |
| Age (yr) | 68.73 ± 1.78 | 67.88 ± 1.29 | 0.705 |
| BMI (kg/m²) | 27.37 ± 1.48 | 27.85 ± 1.54 | 0.824 |
| Δ Creatinine (mg/dL) | -0.001 ± 0.05 | -0.012 ± 0.02 | 0.932 |

Values are presented as means ± Standard Error for age (years), body mass index (BMI, kg/m²), and Δ Creatinine (mg/dL) and proportions of males and females in each group. No significant interactions were observed between groups at α = 0.05.