

What Happens on the Back Table? Viability and Osteogenic Potential of RIA Bone Graft as a Function of Time and Temperature

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Purpose: Our objective was to provide guidelines for reamed irrigator aspirator (RIA) harvest in nonunion surgery to best manage modifiable intraoperative factors, like storage temperature and time, for optimal graft viability. Our hypothesis was that RIA graft will show decreased cell viability as a function of increased time and storage temperature.

Methods: Autologous bone graft samples were obtained using a RIA system from 10 patients undergoing harvest for the treatment of femoral or tibial nonunion. A 10-cc sample of cancellous bone graft was divided into 10 homogeneous samples. A control sample was processed immediately and analyzed using fluorescence-activated cell sorting to determine its cell viability. The remaining samples were stored at 1 of 3 temperatures (0°C, 15°C, and 37°C) and processed similarly at 60 and 120 minutes. The percent of viable cells was recorded for each time and temperature condition. A paired Wilcoxon signed rank test was used to compare the mean change in percent viability and the mean percent viability for each temperature at 120 minutes. A power analysis was conducted based off the mean effect size.

Results: Figure 1 shows a forest plot with the paired mean differences in cell viability as compared to the control sample. The mean effect size was 0.4 and no significant differences in the mean percentage of viable cells were detected ($P \geq 0.08$). At 120 minutes, the mean difference in cell viability for 0°C versus 15°C was 0.01 (95% confidence interval [CI] -0.04 to 0.05, $P = 0.70$); 0°C versus 37°C was -0.01 (95% CI -0.07 to 0.06, $P = 0.56$); and 15°C versus 37°C was 0.002 (95% CI -0.047 to 0.052, $P = 0.77$). Power analysis estimated that a sample size of 52 patients would be needed to detect a difference.

Conclusion: The results of our pilot study indicate that storage temperature and time may have less of an effect on cell viability than previously hypothesized. Further research with more patients is needed to confirm these preliminary results.