Comparison of Reamer-Irrigator Aspirator (RIA) Autogenous Bone Graft versus Bone Marrow Aspirate Concentrate (BMC) in the Percutaneous Treatment of Long Bone Nonunions: A Canine Model

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Purpose: Our objective was to compare the effects of percutaneously delivered bone marrow aspirate concentrate (BMC) or reamer-irrigator-aspirator (RIA) suspension on bone healing in a validated preclinical canine ulnar nonunion model. We hypothesized that BMC would be superior to RIA in inducing bone formation across a nonunion site after percutaneous application. The null hypothesis was that there would be no difference.

Methods: We created a bilateral ulnar nonunion model in 3 canines. RIA from the ipsilateral femur and BMC from the proximal humerus were harvested and percutaneously administered into either the left or right ulna. The same volume of RIA and BMC was applied on each side. After 8 weeks the dogs were sacrificed, and the nonunions were evaluated via radiographic, biomechanical, and histologic testing.

Results: All dogs survived for the intended study duration, formed radiographic nonunions at the defect site 8 weeks after creation, and underwent the assigned percutaneous treatment. Radiographic and macroscopic assessments of bone healing at the defect sites revealed superior bridging-callous formation in BMC-treated nonunions. Histologic analyses revealed greater amount of bony bridging and callous formation in the BMC group. There were no significant differences in biomechanical testing.

Conclusion: BMC appears to be superior to RIA for the percutaneous treatment of long bone nonunions.