

Bone Grafts Prepared with Selective Cell Retention Technology Heal Canine Segmental Defects as Effectively as Autograft

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ABSTRACT: Using a canine critical-size segmental defect model, a two-phased study was undertaken to evaluate the healing efficacy of demineralized bone and cancellous chips (DBM-CC) enriched with osteoprogenitor cells using a Selective Cell Retention (SCR) technology. The goals of this study were: 1) to determine the bone-healing efficacy of SCR-enriched grafts versus autograft, and 2) to assess the value of clotting SCR-enriched grafts with platelet-rich plasma (PRP). Thirty dogs were included in Phase I: 18 dogs were treated with an SCR-enriched DBM-CC graft clotted with autologous bone marrow, and were compared to 12 autograft controls. In Phase II, 24 animals were divided into 4 groups of 6 animals, each treated with a different bone graft material: 1) iliac crest autograft, 2) DBM-CC alone, 3) DBM-CC saturated with marrow, and 4) SCR-enriched DBM-CC clotted with PRP. All grafts were placed unilaterally in a 21-mm long osteoperiosteal femoral, instrumented, critical-size defect. Radiographs were obtained for all animals postoperatively and every 4–16 weeks; animals were then sacrificed. All femurs were prepared for histology. Femurs in the Phase II study were also analyzed by micro-CT. At 16 weeks, healing—defined by bridging bone across the defects—was observed in 50% of the DBM-CC alone group and 67% of the DBM-CC saturated with marrow group; 100% of the autograft and SCR-enriched DBM-CC groups were healed. Histologically, grafts clotted with PRP showed more mature bone than those implanted with autologous bone, which in turn were similar to those implanted with bone marrow clotted SCR-enriched grafts. These results demonstrated that: 1) SCR-enriched DBM-CC was equivalent to autograft to repair critical-size defects, and 2) while not statistically significant, PRP may have accelerated bone maturation when used to clot osteoprogenitor-enriched DBM-CC grafts—as compared to cell-enriched, DBM-CC grafts without PRP—in large animal models. © 2006 Orthopaedic Research Society. Published by Wiley Periodicals, Inc. *J Orthop Res* 24:857–866, 2006

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