

# In Vivo Study on the Healing of Bone Defects Treated with Bone Marrow Stromal Cells, Platelet-Rich Plasma, and Freeze-Dried Bone Allografts, Alone and in Combination

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**ABSTRACT:** The repair of confined trabecular bone defects in rabbits treated by autologous bone marrow stromal cells (BMSC), platelet-rich plasma (PRP), freeze-dried bone allografts (FDBA) alone and in combination (BMSC + PRP; FDBA + BMSC; FDBA + PRP; FDBA + PRP + BMSC) was compared. A critical size defect was created in the distal part of the femurs of 48 adult rabbits. Histology and histomorphometry were used in the evaluation of healing at 2, 4, and 12 weeks after surgery. The healing rate (%) was calculated by measuring the residual bone defect area. Architecture of the newly formed bone was compared with that of bone at the same distal femur area of healthy rabbits. The defect healing rate was higher in PRP + BMSC, FDBA + PRP, FDBA + BMSC, and FDBA + PRP + BMSC treatments, while lower values were achieved with PRP treatment at all experimental times. The highest bone-healing rate at 2 weeks was achieved with FDBA + PRP + BMSC treatment, which resulted significantly different from PRP ( $p < 0.05$ ) and BMSC ( $p < 0.05$ ) treatments. At 4 weeks, the bone-healing rate increased except for PRP treatment. Finally, the bone-healing rate of FDBA + PRP, FDBA + BMSC, and FDBA + PRP + BMSC was significantly higher than that of PRP at 12 weeks ( $p < 0.05$ ). At 12 weeks, significant differences still existed between PRP, BMSC, and FDBA groups and normal bone ( $p < 0.05$ ). These results showed that the combination of FDBA, BMSC and PRP permitted an acceleration in bone healing and bone remodeling processes. © 2006 Orthopaedic Research Society. Published by Wiley Periodicals, Inc. *J Orthop Res* 24:877–888, 2006

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