

Comparison Between rhBMP-2 and Autogenous Bone Grafts in the Induced Membrane Technique for Critical-sized Bone Defects in Rabbit Femurs

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Purpose: In induced-membrane technique (IMT) for critical-sized bone defects (CSBDs), surgeons require alternative graft materials with results equivalent to autogenous bone graft (ABG) considering the limited volume of ABG and donor site morbidity. Recombinant human bone morphogenetic protein-2 (rhBMP-2) has potential, but there have been no studies comparing rhBMP-2 graft and ABG in IMT.

Methods: CSBDs were made in the femurs of rabbits and IMT was performed. The rhBMP-2 with hydrogel mixed hydroxyapatite (HA)/beta-tricalcium phosphate (β -TCP) carrier graft was performed in the BMP group, while ABG from the iliac crest was performed in the ABG group. Radiographic, biomechanical, and histologic evaluations were performed and the results were compared between the groups.

Results: The BMP group had significantly superior results than the ABG group in terms of radiographic scores at 6 weeks ($P = 0.010$) and 8 weeks ($P = 0.003$); bone mineral density ($P = 0.018$); dynamic stiffness before plate removal at 1, 3, 6, and 9 Hz ($P = 0.003, 0.001, <0.001$, and <0.001 , respectively); dynamic stiffness after plate removal at 6 and 9 Hz ($P = 0.029$ and 0.023); static stiffness after plate removal ($P = 0.016$); and osteopontin expression ($P = 0.022$). Other results, including the bone union rate; volumetric measurement of regenerated bone; viscoelasticity; dynamic stiffness after plate removal at 1 and 3 Hz; static stiffness before plate removal; ratio of mineralized area; cell counts per area of osteocytes, osteoblasts, and osteoclasts; ratio of mature bone area; and osteocalcin expression, were equivalent in the 2 groups.

Conclusions: The rhBMP-2 with HA/ β -TCP/hydrogel carrier grafts in IMT for managing CSBDs is a reasonable alternative to ABG.