# Effect of Bone Marrow Aspirate Concentrate with Different Carriers for the Regeneration of Tendon in a Chronic Rotator Cuff Tear Model of Rabbit

Joo Han Oh, Hyeon Jang Jeong[1]
[1]Seoul National University Bundang Hospital

INTRODUCTION:

Even though bone marrow aspirate concentrates (BMAC) was investigated to promote tendon-to-bone healing in animal and human study, it is still debatable whether stem/progenitor cells could maintain the biological stability without any carrier environment. This study was designed to evaluate the effect of bone marrow aspirate concentrate with different carriers for the regeneration of tendon in a chronic rotator cuff tear (RCT) model of rabbit.

METHODS:

In vitro, the cellular properties as well as the expression profiles of growth factors of BMAC were analyzed. The multi-lineage differentiation potential of BMAC with different carriers (atelocollagen and polydeoxyribonucleotide) was also assayed. In vivo, 64 rabbits were randomly allocated 4 groups (n = 16 each). To create the chronic RCT model, we induced complete supraspinatus tendon tears in both shoulders, and left them untreated for 6 weeks. All transected tendons were repaired in a transosseous manner with saline injection in group A, only BMAC injection in group B, BMAC + polydeoxyribonucleotide (PDRN) injection in group C, and BMAC + atelocollagen injection in group D. Genetic analysis was performed at 4 weeks after repair (8 rabbits per group), and the biomechanical analysis was performed at 12 weeks after repair (8 rabbits per group).

RESULTS: In vitro, the successful multi-lineage differentiations of BMACs were achieved under the both PDRN and atelocollagen environment, forming multiphase tissues with tendon and cartilage-like regions, and there were no differentiation differences between two carrier environments. In vivo, groups with carriers (group C and D) showed higher collagen type Iα1, bone morphogenetic protein 2, and aggrecan expressions than the control groups without any carrier ($P < 0.006$, 0.014 and 0.015, respectively) at 4 weeks after repair. There was no difference between group C and D. For the biomechanical evaluation, group D showed a significantly higher load-to-failure rate than the other groups ($P < 0.001$) at 12 weeks after repair.

DISCUSSION AND CONCLUSION:

BMAC with two different carriers could effectively achieve the multi-lineage differentiations and gene expressions, compared to those without carrier, at the early phase. However, the combination of BMAC and atelocollagen finally had more superior tendon-to-bone healing effects in a RCT model of rabbit.