

## Comparison of Mesenchymal Stem Cell Versus Bone Marrow Treatment to Enhance Tendon to Bone Healing in an Animal Model

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**Objectives:** Although anterior cruciate ligament reconstruction is one of the most common procedures in the field of sports medicine, less than 50% can return to previous activity level partially due to poor biological incorporation of tendon to bone. The aim of the study is to investigate the biological and mechanical effects of Mesenchymal Stem Cell (MSC) and Bone Marrow (BM) treatment for early tendon graft healing in a bone tunnel.

**Methods:** 60 Wistar Albino rats were enrolled in the study and divided in 3 groups equal in number. In all animals a bilateral 1.2 mm bone tunnel was created in proximal tibia. 15 mm Digital Flexor tendons were harvested from each lower extremity and passed from each tunnel. Medial ends of the graft was secured to bone using a custom made endobutton while lateral portion was sutured to periosteum. 100µl whole Bone marrow was aspirated from group 1 animals and injected into the tunnel after tendon transfer while 106 MSCs in 50µl HBSS was injected in the tunnel in group 2. Group 3 was taken as control. Tendon to bone healing was evaluated via immunohistochemistry and mechanical testing at 2 and 6 weeks.

**Results:** At 2 weeks the tendon to bone interface tissue was found to be stronger in the BM treatment group whereas there was no difference in stiffness between group 1 and 2. Interface tissue width was found to be significantly decreased in the BM group compared to control and MSC treatment groups ( $p=0.0012$ ,  $p=0.0001$ ). At 2 weeks the number of M1 macrophages at the interface tissue was found to be significantly low in the BM group while M2 macrophages were highest in the MSC group. Cellularity was observed significantly high in the MSC group while tissue density was lowest in the BM group due to accelerated graft degradation at 2 weeks.

**Conclusion:** Although both Bone Marrow and Mesenchymal Stem Cell treatments enhance tendon to bone healing by accelerating the remodeling process, Bone Marrow treatment reveals a more anti-inflammatory healing with improved mechanical properties.

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