The Study Of Mesenchymal Stem Cells Seeded Amnion In Augmenting Tendon Regeneration In Vivo

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INTRODUCTION:

Adhesions following tendon repair can delay healing and post-surgical rehabilitation, which in turn reduces the functions of the affected limb. We hypothesized that the use of (i) human amniotic membrane (HAM) in tendon repair could reduce peritendinous adhesion, and (ii) the Mesenchymal Stem Cell (MSC) seeded HAM (HAM+MSC) could further reduce peritendinous adhesion by suppressing inflammation and enhance tendon healing. A study was conducted to evaluate outcomes of tendon repair augmented with HAM and HAM+MSC.

METHODS:

A total of 172 male Sprague-Dawley (SD) rats were used in this study. Ten rats (n=10) were sacrificed for bone marrow MSC isolates. The remaining 162 rats were randomly divided into 3 groups:

1). Suture group: Right Achilles tendon repaired with Modified Kessler suture (MKS) method,

2). Human Amniotic Membrane (HAM) group: Same method used in the Suture group and covered the repair site with HAM, and

3). HAM+MSC group: Same method used in the Suture group but covered with MSC seeded HAM.

Left and right Achilles tendons were harvested post-surgically at 3, 6 and 9 weeks for macroscopic adhesion evaluation, histological analysis, collagen assay and biomechanical testing. Statistical analysis was performed to assess the statistical significance ($p<0.05$).

RESULTS:

HAM and HAM+MSC groups had lower adhesion scores than the Suture group ($p<0.01$). HAM and HAM+MSC groups showed a better tendon healing progress than the Suture group using Soslowsky's scoring system ($p<0.01$). The collagen content of the 3 operated groups were lower than the normal control group ($p<0.05$). The Young's modulus of operated groups was lower than normal control group ($p<0.01$). There was no statistical significant difference between the 3 operated groups in term of collagen content and Young's modulus.

Figure 1: Repaired tendon with application of HAM coverage.

Figure 2: HAM fully covered tendon repaired site.

DISCUSSIONS:

Both HAM and HAM+MSC groups demonstrated excellent result in peritendinous adhesion prevention and tendon healing than the Suture group possibly owing to the anti-inflammatory and barrier properties of HAM. The role of MSC alone in enhancing tendon healing could not be determined in this study.

CONCLUSION:

Augmentation of tendon repair using HAM or HAM+MSC resulted in potentially lower incidence of adhesion formation and showed good healing of tendon.