**Allogenic Tendon-derived Stem Cells (TDSCs) Promoted Tendon Regeneration**

**INTRODUCTION**

The use of appropriate cell source is one of the key issues in tendon tissue engineering. This study aimed to investigate the use of allogenic tendon-derived stem cells (TDSCs) for tendon repair in a tendon window injury model.

**METHODS**

All animal experiments were approved by the Animal Experimentation Ethics Committee, the Chinese University of Hong Kong. GFP-TDSCs were isolated from the patellar tendon of GFP rats. The procedure was established (Rui et al., 2010; accepted).

One hundred and fifty-six Sprague Dawley male adult rats (7-8 weeks) were used in this study. To create the tendon defect, the central one-third of the patellar tendon (~1 mm in width) was removed from the distal apex of the patella to the insertion of the tibia tuberosity with two stacked sharp blades according to our well-established protocol (Lui et al., 2007). The operated rats were divided into 2 groups: (a) fibrin glue-only group; (b) allogeneic GFP-TDSCs in fibrin glue group.

The fibrin glue constructs with or without GFP-TDSCs were placed in the tendon defect and the wound was then closed in layers. The animals were allowed to have free-cage activity until euthanasia. At week 1, 2, 4, 6 and 8 after surgery, six animals in each group were killed and the patellar tendons were harvested for ex vivo fluorescence imaging for examination of the presence of transplanted cells, followed by histology for the examination of cellularity and vascularity of the regenerated tissue and histological staining and collagen alignment by polarization microscopy. The engraftment of GFP-TDSCs in the tendon defect was followed by immunohistochemical staining of GFP signal. At week 2, 4 and 8, another 10 animals from each group were euthanatized and both patellar tendons (injured and intact) were harvested for ex vivo fluorescence imaging for the examination of cellularity and vascularity of the regenerated tissue by H&E staining and collagen alignment by polarization microscopy. The engraftment of GFP-TDSCs in the tendon defect was followed by immunohistochemical staining of GFP signal. At week 2, 4 and 8, another 10 animals from each group were euthanatized and both patellar tendons (injured and intact) were harvested for biomechanical test.

Data was presented as mean ± SD and shown in box plots. Comparison of 2 groups at different time points was done using 2-way ANOVA followed by subsequent analysis between groups and among different time points by Tukey’s b test. All the data analysis was done using SPSS (SPSS Inc, Chicago, IL, version 16.0). p <0.050 was regarded as statistically significant.

**RESULTS**

The ex vivo fluorescence imaging showed the presence of transplanted cells in the wound site. The control group have no fluorescence signal at 1, 2, 4 week while TDSC group have fluorescence signal at 1, 2 week. The fluorescence signals weaken in 2 week compared to 1 week, and disappeared at 4 week.

The cellularity was high at 1 week in Group 2 compared to Group 1 (Figure 2). More extracellular matrix was produced at 2 and 4 week in Group 2 compared to Group 1(Figure 2). The neo-fiber alignment was better at 4 week in Group 2 compared to Group 1.

**DISCUSSION**

In conclusion, allogeneic TDSCs could promote earlier and better recovery after tendon injury. TDSCs therefore can be used as an alternative cell source for tendon regeneration. More time point data are needed to confirm the conclusion of histology and mechanical test.

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