INTRODUCTION: Successful ACL reconstruction with tendon graft necessitates effective healing of the tendon graft in the femur and tibia bone tunnels. Healing of a tendon graft in a bone tunnel requires bone ingrowth into the tendon [1]. Bone morphogenetic protein-2 (BMP-2) can augment tendon-to-bone healing. This study presents a novel technique of fabricating injectable PEGDA hydrogel photoencapsulated peristeal stem cells for tendon-to-bone healing in a rabbit model, directly fabricating injectable PEGDA hydrogel photoencapsulation of peristeal cells, 2 million Daltons, cells were obtained by stripping the periosteum from the tibia of New Zealand white rabbits and resuspended in high-glucose Dulbecco Modified Eagle’s Medium supplemented with 10% FBS, 1% penicillin-streptomycin, and 0.1 μM dexamethasone, with 50 μg/ml L-ascorbic acid and 10 mM β-glycerol phosphate added to promote the osteoblastic phenotype. Conjugation of HA-tethered BMP-2 Polymeric hydrogel of 2.3% hyaluronic acid (HA; 1.1 million Daltons, Lifecore) was added to activation buffer consisting of 2-N,N-dimethylanilinoethyl ethane sulfonic acid, with 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide and N-hydroxysuccinimide. Then 500 ng/ml of recombinant human BMP-2 (R&D) was conjugated with activated-HA.

Figure 1: (A) PEGDA gel construct. (B) Inverted light microscopy image of 0d construct immediately after encapsulation of peristeal cells. (C) Cells-encapsulated soluble BMP-2 gel and (D) Cells-encapsulated HA-tethered BMP-2 gel were taken after 2 weeks culture.

Figure 2: Photoencapsulation of peristeal cells in (A) soluble BMP-2 gel and (B) HA-tethered BMP-2 gel and stained with a Live/Dead cell viability assay.

Figure 3: Immunochemical staining of cells-encapsulated in hydrogels for osteocalcin (top) and osteopontin (bottom) after 2 weeks culture. (A and C) soluble BMP-2 gel; (B and D) HA-tethered BMP-2 gel.

Figure 4: Histology of the tendon to bone interface (T) and bone (B) interface.

REFERENCES:

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