Novel Device to Achieve Intervertebral Disc Regeneration Using Human Stem Cell Generated Nucleus Pulposus Cells

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CONCLUSION

• NPCs were efficient in regenerating the degenerated intervertebral disc and provide basis and impetus for clinical studies to treat DDD.

A combination of TGGD technology can restore disc height first followed by injection of NPCs to restore the nucleus pulposus and may result in a viable biological treatment for patients suffering from DDD.

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BACKGROUND

• Intervertebral disc (IVD) degeneration is characterized by the loss of nucleus pulposus (NP) leading to disc space collapse which is a common cause of low back pain.

• Currently, degenerative disc disease (DDD) has no biological cure and human stem cell therapy is increasingly being considered for its treatment. However, stem cells alone may not be adequate to provide bio-mechanical disc height restoration.

OBJECTIVE

• Disc restorative technology is being investigated that might restore the bio-mechanical function of the degenerated disc via a process of gradual tissue growth generated distraction (TGGD).

• Once disc height is restored the injection of nucleus pulposus cells (NPCs) can restore the biological function of the degenerated disc.

METHODS

• We investigated the feasibility of human umbilical cord mesenchymal stem cells (UC-MSCs) differentiated into NPCs in vitro in an in-vivo rabbit model of DDD.

RESULTS

• Transplanted NPCs survived, integrated and displayed homing into nucleus pulposus (NP) of the rabbit degenerated disc with a significant improvement in the nucleus pulposus histology, cellularity, extracellular matrix proteins, water, and glycosaminoglycan contents.

• Implanted chondroprogenitors cells survived and produced extracellular matrix

• Control

• Post-transplantation analysis of water and glycosaminoglycan (GAG) contents in rabbit IVD

CONCLUSION

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