Is Herniated Disc Tissue an Adequate Cell Source for Nucleus Pulposus Regeneration?

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The object of the study is to characterize the regenerative potential of cells isolated from herniated disc tissue obtained during microdiscectomy.

The acquired data could help to evaluate the feasibility of these cells for autologous disc cell transplantation.
Methods

For each patient (n = 5, mean age 45 years) tissue from the nucleus pulposus compartment as well as herniated disc tissue were obtained separately during microdiscectomy of symptomatic herniated lumbar discs.

Cells were isolated and in-vitro cell expansion for cells from herniated disc tissue was accomplished using human serum and fibroblast growth factor-2.

For three-dimensional culture, expanded cells were loaded in a fibrin-hyaluronan solution on polyglycolic acid scaffolds for two weeks.

Formation of disc tissue was documented by histological staining of the extracellular matrix as well as gene expression analysis of typical disc marker genes.
Results

Cells isolated from herniated disc tissue showed significant signs of de-differentiation and degeneration in comparison to cells from tissue of the nucleus compartment.
With in-vitro cell expansion, further de-differentiation with distinct suppression of major matrix molecules like aggrecan and type II collagen were observed. Unlike in previous reports with cells from the nucleus compartment, cells from herniated disc tissue showed only a weak re-differentiation process in three-dimensional culture.
Propidium-iodide/fluorescein-diacetate staining documented that three-dimensional assembly of these cells in polyglycolic acid scaffolds allows prolonged culture and high viability.
Conclusion

These results suggest a very limited regenerative potential for cells harvested from herniated disc tissue in this series.

Further research on two major aspects in patient selection is suggested before conducting reasonable clinical trials in this matter:

(1) diagnostic strategies to predict the regenerative potential of harvested cells at a radiological or cell-biological level

(2) clinical assessment strategies to elucidate the metabolic state of the targeted disc.
Disclosure

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Thank you!