

## Allogeneic intervertebral disc transplantation: Results of pre-clinical and clinical studies

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**INTRODUCTION:** The concept of motion preservation after intervertebral disc excision is attractive and gaining popularity. Current methods of preservation have included nucleus replacement and prosthetic intervertebral disc replacement. While the latter is particularly gaining popularity, the long term results of an artificial disc are still not known.

The concept of intervertebral disc transplantation is borrowed from the success of other large organ transplantation. Since 1992, the authors have conducted a series of experiments to study the feasibility of such a procedure in a primate model using autografts, fresh allografts and fresh-frozen allografts<sup>1,2</sup>.

**METHODS:** The surgical procedure involves a near complete excision of the intervertebral disc and its bony end-plate in the recipient, while from the donor the whole intervertebral disc is excised en-bloc with its bony end-plate. Size and height matching is carried out before insertion of the appropriate donor disc.

**RESULTS:** The transplanted discs were shown histologically to be viable, metabolically active, and biomechanically be able to maintain mobility and stability. However, with long term follow-up, the transplanted disc appears to undergo progressive degeneration<sup>1,2</sup>.

**DISCUSSION & CONCLUSIONS:** This is the first study to demonstrate that allogeneic disc transplantation to be viable. With fresh frozen allografts, there appears to be no significant immunologic response. Healing of the end-plates and therefore stability of the transplanted disc occurs reliably. However, before healing of the bony end-plates and re-establishment of a blood supply, nutrition to the transplanted disc maybe lacking and hence cell necrosis may occur. Such that with a reduced cell population inside the nucleus, they are

unable to maintain the extracellular matrix, and maybe responsible for the progressive degeneration after transplantation. Nevertheless, it was felt that as long as the segment was clinically asymptomatic, such transplantation could at least postpone a fusion of the segment which may have long-term effect on the juxtafusion levels.

Since 4 years ago, one of the coauthors has started a pilot series of 8 cases of fresh-frozen disc allograft in the human cervical spine. The medium-term follow up results to date have been very satisfactory. Neurologically the patients have all improved. There was no pain, radiologically there was no sign of instability and the segments were still mobile on flexion-extension.

Future directions include a detailed characterization of the cellular and metabolic events after transplantation, and use of autologous culture expanded stem cells or nucleus cells to repopulate the transplanted disc.

**REFERENCES:** <sup>1</sup>K.D. Luk, D.K. Ruan, D.H. Chow et al (1997) *Clin Orthop Relat Res* **337**:13-26.

<sup>2</sup> K.D. Luk, D.K. Ruan, D.S. Lu et al (2003) *Spine* **28**:864-9.