Riboflavin Transporter Deficiency

Moriguchi et al., demonstrated that riboflavin crosslinked high-density collagen gels (HDC) can facilitate annular repair in vivo.

42 rats, tail disc punctured with an 18-gauge needle, were divided into 3 groups: untreated (n=6), injected with crosslinked HDC (n=18), and injected with Annulus Fibrosus cell-laden crosslinked HDC (n=18). Ovine AF cells were mixed with HDC gels prior to injection. X-rays and MRIs were conducted over 5 weeks, determining disc height index (DHI), nucleus pulposus (NP) size, and hydration. Histological assessments evaluated the viability of implanted cells and degree of annular repair.

Although average DHIs of both HDC gel groups were higher than those of the puncture control group at 5 weeks, the retention of disc height, NP size and hydration at 1 and 5 weeks was significant for the cellular group compared to the punctured, and at 5 weeks to the acellular group. Histological assessment indicated that AF cell-laden HDC gels have accelerated reparative sealing compared to acellular HDC gels.

AF cell-laden HDC gels have the ability of better repairing annular defects than acellular gels after needle puncture.

This project addresses the compelling demand of a sufficient treatment strategy for degenerative disc disease (DDD) perpetuated by annulus fibrosus (AF) injury, a major cause of morbidity and burden to health care systems.

The study is designed to answer the question of whether injectable, photo-crosslinked, high density collagen gels can seal defects in the annulus fibrosus of rats and prevent disc degeneration. Furthermore, we investigated whether the healing of AF defects will be enhanced by the delivery of AF cells (fibrochondrocytes) to these defects. The use of cell-laden collagen gels in spine surgery holds promise for a wide array of applications, from current discectomy procedures to future nucleus pulposus reparative therapies [1)].

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performed a retrospective review of 288 consecutive neurosurgical procedures using a fibrinogen based collagen fleece (TachoComb), a resorbable mesh of collagen from horse tendons, coated with human fibrinogen, bovine thrombin, bovine aprotinin and riboflavin (for marking the coated side), for dural substitution. The fibrinogen and thrombin imitate the last step of the coagulation cascade. On contact with bleeding wounds or other body fluids the coagulation factors dissolve and a link is formed between the collagen carrier and the wound surface. Thrombin converts fibrinogen into fibrin by splitting off peptides. Aprotinin prevents premature lysis of the fibrin clot by plasmin.

FINDINGS: Neither superficial or deep wound infections nor aseptic meningitis were noted. We found good fibrous incorporation of TachoComb into the surrounding normal dura. Postoperative cerebrospinal-fluid (CSF) leaks developed in only five cases, who had to be re-operated, upon as well as one patient with a rebleeding. In another four cases, there was notable subcutaneous cerebrospinal-fluid accumulation without CSF-leak. They required a lumbar cerebrospinal-fluid drainage.

INTERPRETATION: We conclude that TachoComb is a valuable alternative to the patients fibrous tissues for dural repair in cases in which autogenous tissues are either unavailable or insufficient for proper reconstruction [2)].

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Moriguchi Y, Borde B, Berlin C, Wipplinger C, Sloan SR, Kirnaz S, Pennicooke B, Navarro-Ramirez R, Khair T, Grunert P, Kim E, Bonassar L, Härtl R. In Vivo Annular Repair using High-Density Collagen Gel Seeded with Annulus Fibrosus Cells. Acta Biomater. 2018 Jul 4. pii: S1742-7061(18)30402-1. doi: 10.1016/j.actbio.2018.07.008. [Epub ahead of print] PubMed PMID: 29981494.
2)
Reddy M, Schöggl A, Reddy B, Saringer W, Weigel G, Matula C. A clinical study of a fibrinogen-based collagen fleece for dural repair in neurosurgery. Acta Neurochir (Wien). 2002 Mar;144(3):265-9; discussion 269. PubMed PMID: 11956939.