

Translational Models for Knee Meniscus Repair and Replacement with Nanofibrous Scaffolds

The meniscus is a wedge-shaped fibro-cartilaginous tissue in the knee that is integral to the healthy functioning of the joint. The meniscus increases knee articular congruency, transmits load, and absorbs shock. Any endeavor to tissue engineer knee meniscus requires testing candidate constructs in a suitable *in vivo* large animal model prior to developing a clinically useful intervention. Scaffolds optimized in our lab are currently being evaluated in an ovine *in vivo* model developed in collaboration with Dr. Thomas Schaer and his team at the Comparative Orthopaedics Research Laboratory at New Bolton Center at the University of Pennsylvania Veterinary School. These studies allow us to determine how *in vitro* scaffold optimization steps lead to functionally relevant performance in the joint space, namely the prevention of knee joint cartilage degeneration. Over the long term, our goal is to deploy optimized material technologies that advance integration and revascularization, while instilling directed mechanical properties, to restore structure and function to the native meniscus

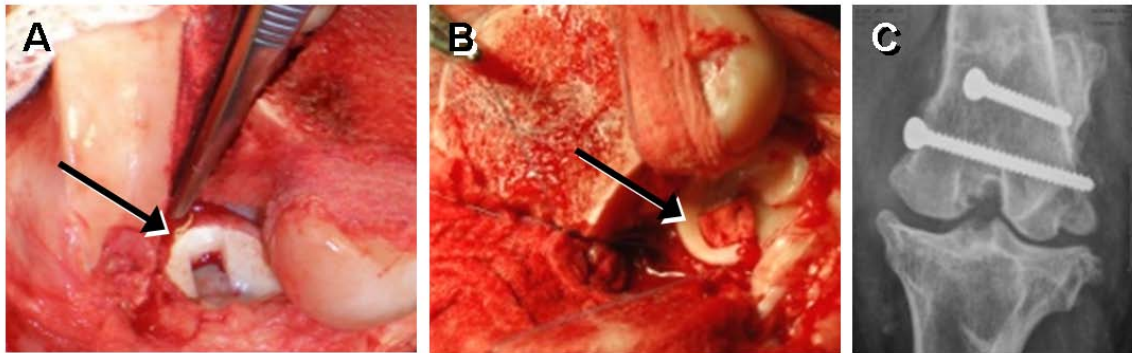


Figure 1: Meniscus defect creation (A, arrow), implantation of nanofibrous scaffold (B, arrow), and 6-month radiographic image of joint (C).

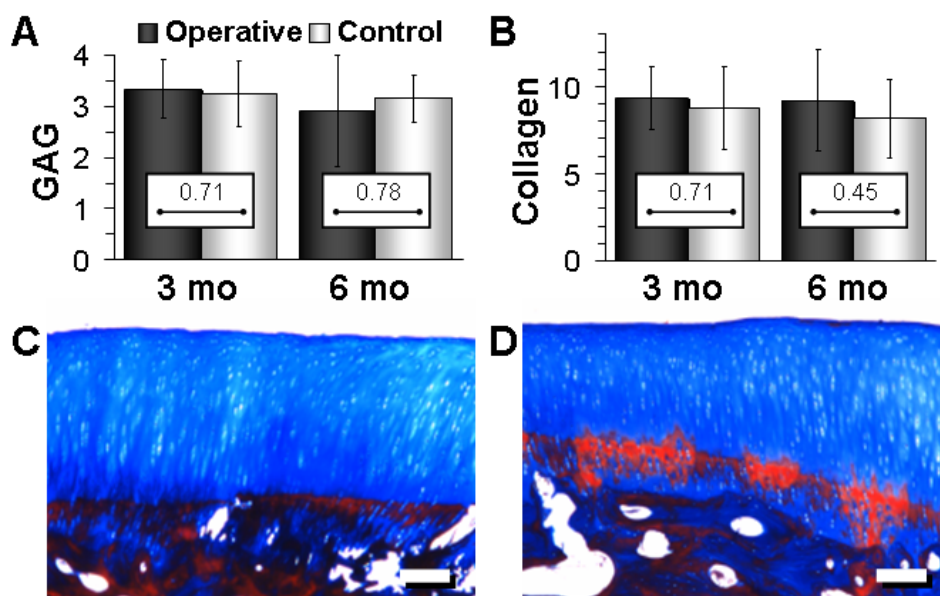


Figure 2: GAG (A) and collagen (B) content (% ww) of tibial articular cartilage at 3- and 6-months (n=3-4/time point). Trichrome stain (C: 3-month operative; D: 3-month control), scale bars: 200 μ m.

Recent Publications:

1. DeCoons RM; Shah RP; Gee AO; Baker BM; Guevara JL; Modesto RB; Schaer TP; Mauck RL. In Vivo Meniscus Repair with Anatomic Nanofibrous Scaffolds: A Preliminary Report. ORS 2010.
2. Modesto RB, Mauck RL, Baker BM, Underwood C, Schaer TP. Evaluation of a Novel Surgical Technique in an in vivo Ovine Model to Access the Posterior Horn of the Medial Meniscus. 2009 World Congress on Osteoarthritis, September 10 - 13, 2009, Montreal, Quebec, poster presentation.

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