

Knee cartilage repair technique shows improvement in patient outcomes and regeneration

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A natural tissue graft can spur regeneration of cartilage and improve symptoms in patients who have cartilage damage in their knee, according to a study by researchers from Hospital for Special Surgery. The new research, the first case-series evaluation of De Novo NT Natural Tissue Graft, will be presented at the annual meeting of the American Orthopaedic Society for Sports Medicine (AOSSM), to be held July 11-14, in Chicago.

"The results at this time are encouraging," said lead author of the study Scott Rodeo, M.D., [orthopedic surgeon](#) and co-chief of the [sports medicine](#) and shoulder service at Hospital for Special Surgery, in New York City. "De Novo NT compares favorably to our existing techniques, given that it is easy to do and involves a one step procedure. We are cautiously optimistic. It clearly regenerates tissue, but we need further long-term followup."

The smooth, white tissue covering the ends of bones where they come together to form joints is called articular cartilage. In the knee, this cartilage can be damaged by a traumatic sports accident, a bad fall, or normal wear and tear in active individuals. Articular cartilage [lesions](#) can cause pain and lead to [osteoarthritis](#). "Articular cartilage injuries to the knee are fairly common, and they are hard to treat," said Dr. Rodeo. "Cartilage has no capacity to heal spontaneously, and cartilage lesions over time can get progressively larger."

There are no perfect options for treating articular cartilage lesions, but current [therapeutic approaches](#) include surgeries such as microfracture, a procedure that involves drilling small holes in bones to induce bleeding and spark healing. Surgeons can also use [donor tissue](#) that can be sized and fitted to the defect, but donor tissue is in limited supply and reestablishing congruity of the cartilage surface using this method can be difficult.

De Novo NT is an FDA approved cartilage repair technique. The product is made out of minced cartilage from [organ donors](#) under the age of 13. Unlike cartilage in adults, this young tissue has a high proliferative capacity. Cells from the transplanted cartilage escape or migrate into surrounding area tissues, multiply, and form a new cartilage tissue matrix that integrates with the surrounding host tissue. This technique eliminates the need for harvesting and requires less suturing because the product uses a fibrin sealant to secure the particulated tissue pieces into the lesion. Fibrin is an insoluble "sticky" protein involved in the clotting of blood.

"The small pieces of juvenile cartilage are less than a millimeter in size, and what happens is the cells can migrate out of these small pieces of cartilage," said Dr. Rodeo. "We are trying to take advantage of the high proliferative capacity of the tissue."

Until now, only a few case-reports of this product have been published. The tissue [graft](#) falls into a category of products that does not have to undergo the rigorous clinical trial process through which drugs, for example, are approved.

In the study presented at the AOSSM meeting, clinicians used De Novo NT to treat 17 patients who had [cartilage damage](#) on the kneecap (specifically focal patellofemoral cartilage lesions). The average lesion size was 203 millimeters. Clinicians compared symptom assessment

survey data and MRI images at baseline and at two years of followup and identified improvements in all patients.

At two years of followup, patients had roughly a 30% improvement in scores from the international knee documentation committee (IKDC) health evaluation form, a 20% improvement in the IKDC subjective form, and a 25% Knee Outcome Survey form (53.5 vs. 75.5). These surveys gauge the degree of symptoms, such as knee swelling and pain, that a patient is experiencing and how much knee impairment impacts overall well-being, activities of daily living, work, and athletic and social activities. "The improvements are clinically significant, as well as statistically significant," said Dr. Rodeo.

The patients also showed improvements on MRI scans, with traditional MRI technology as well as quantitative T2 mapping MRI. T2 mapping, which evaluates biochemical changes in the cartilage, was developed by HSS investigators including Hollis Potter, M.D., chief of the division of magnetic resonance imaging, director of research in the Department of Radiology and Imaging at HSS. T2 mapping in 6 patients showed prolongation of quantitative T2 values in both the superficial (58.6 vs. 37.4; $P=0.02$) and deep components of the repair tissue (47.18 vs. 28.3; $P=0.005$), demonstrating that the tissue still differs from normal [cartilage](#).

"Quantitative MRI, when combined with morphologic assessment, allows us to understand the natural history of repair techniques," said Dr. Potter, who was also involved with the study presented at AOSSM. "We gain knowledge about the biology of integration with the host tissue, as well as the repair tissue biochemistry (collagen orientation), all by a noninvasive imaging technique."

Adverse events seen in patients, such as swelling and inflammation, were typical postoperative complications seen after other [cartilage repair](#)

strategies.

"Using symptom outcome scales, we have demonstrated symptomatic improvement, and we have used MRI to carefully evaluate the regenerative tissue," said Dr. Rodeo, who pointed out longer followup is needed. "We need to perform MRIs on a yearly basis to follow the maturation of the [tissue](#)."

Provided by Hospital for Special Surgery

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