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## Publications

### **Clinical validation of fully automated cartilage transverse relaxation time (T2) and thickness analysis using quantitative DESS magnetic resonance imaging**

Wirth, W. (First author), Herger, S., Maschek, S., Wissner, A. (Co-author), Bieri, O., Eckstein, F. (Co-author) & Mündermann, A., Apr 2025, In: MAGNETIC RESONANCE MATERIALS IN PHYSICS BIOLOGY AND MEDICINE. 38, 2, p. 285-297 13 p.

### **Unbiased analysis of knee cartilage thickness change over three years after sprifermin vs. placebo treatment - A post-hoc analysis from the phase 2B FORWARD study**

Eckstein, F. (First author), Maschek, S., Wirth, W. (Co-author), Ladel, C., Bihlet, A. R., Knight, C., Somberg, K. & Zhao, L., Dec 2024, In: Osteoarthritis and Cartilage Open. 6, 4, 4 p., 100513.

### **Anterior cruciate ligament injury and age affect knee cartilage T2 but not thickness**

Herger, S., Wirth, W. (Co-author), Eckstein, F. (Co-author), Nüesch, C., Egloff, C. & Mündermann, A., Nov 2024, In: OSTEOARTHRITIS AND CARTILAGE . 32, 11, p. 1492-1502 11 p.

### **Can gait patterns be explained by joint structure in people with and without radiographic knee osteoarthritis? Data from the IMI-APPROACH cohort**

Jansen, M. P., Hodgins, D., Mastbergen, S. C., Kloppenburg, M., Blanco, F. J., Haugen, I. K., Berenbaum, F., Eckstein, F. (Co-author), Roemer, F. W. & Wirth, W. (Last author), Nov 2024, In: SKELETAL RADIOLOGY . 53, 11, p. 2409-2416 8 p.

### **Fluctuation of Bone Marrow Lesions and Inflammatory MRI Markers over 2 Years and Concurrent Associations with Quantitative Cartilage Loss**

Roemer, F. W., Jansen, M. P., Maschek, S., Mastbergen, S. C., Marijnissen, A.-K., Wissner, A. (Co-author), Heiss, R., Weinans, H. H., Blanco, F. J., Berenbaum, F., Kloppenburg, M., Haugen, I. K., Eckstein, F. (Co-author), Hunter, D. J., Guermazi, A. & Wirth, W. (Last author), 26 Oct 2024, In: Cartilage. p. 19476035241287694 14 p.

### **Is detection of disease-modifying osteoarthritis drug treatment more effective when performing cartilage morphometry without blinding to MR image acquisition order?**

Eckstein, F. (First author), Wissner, A. (Co-author), Maschek, S., Wirth, W. (Co-author), Ladel, C., Bihlet, A. R., Knight, C., Somberg, K. & Zhao, L., Oct 2024, In: OSTEOARTHRITIS AND CARTILAGE . 32, 10, p. 1346-1351 6 p.

### **Evaluation of an automated laminar cartilage T2 relaxation time analysis method in an early osteoarthritis model**

Wirth, W. (First author), Maschek, S., Wissner, A. (Co-author), Eder, J., Baumgartner, C. F., Chaudhari, A., Berenbaum, F., Eckstein, F. (Last author) & OA-BIO Consortium, 4 Sept 2024, In: SKELETAL RADIOLOGY . 14 p.

### **Sexual dimorphism in articular tissue anatomy – Key to understanding sex differences in osteoarthritis?**

Eckstein, F. (First author), Wirth, W. (Co-author) & Putz, R., Sept 2024, In: OSTEOARTHRITIS AND CARTILAGE . 32, 9, p. 1019-1031 13 p.

### **Sexual dimorphism in peri-articular tissue anatomy – More keys to understanding sex-differences in osteoarthritis?**

Eckstein, F. (First author), Putz, R. & Wirth, W. (Last author), Sept 2024, In: Osteoarthritis and Cartilage Open. 6, 3, 10 p., 100485.

### **The design of a sample rapid magnetic resonance imaging (MRI) acquisition protocol supporting assessment of multiple articular tissues and pathologies in knee osteoarthritis**

Eckstein, F. (First author), Walter-Rittel, T. C., Chaudhari, A. S., Brisson, N. M., Maleitzke, T., Duda, G. N., Wissner, A. (Co-author), Wirth, W. (Co-author) & Winkler, T., Sept 2024, In: Osteoarthritis and Cartilage Open. 6, 3, p. 100505 12 p., 100505.

**Clinical validation of fully automated laminar knee cartilage transverse relaxation time (T2) analysis in anterior cruciate ligament (ACL)-injured knees- on behalf of the osteoarthritis (OA)-Bio consortium**

Eckstein, F. (First author), Brisson, N. M., Maschek, S., Wissner, A. (Co-author), Berenbaum, F., Duda, G. N. & Wirth, W. (Last author), 1 Jul 2024, In: QUANTITATIVE IMAGING IN MEDICINE AND SURGERY. 14, 7, p. 4319-4332 14 p.

**30 Years of MRI-based Cartilage & Bone Morphometry in Knee Osteoarthritis - From Correlation to Clinical Trials**

Eckstein, F. (First author), Wluka, A. E., Wirth, W. (Co-author) & Cicuttini, F., Apr 2024, In: OSTEOARTHRITIS AND CARTILAGE . 32, 4, p. 439-451 13 p.

**Effects of neuromuscular control and strengthening exercises on MRI-measured thigh tissue composition and muscle properties in people with knee osteoarthritis - an exploratory secondary analysis from a randomized controlled trial**

Holm, P. M., Blankholm, A. D., Nielsen, J. L., Bandholm, T., Wirth, W. (Co-author), Wissner, A. (Co-author), Kemnitz, J. (Co-author), Eckstein, F. (Co-author), Schröder, H. M., Wernbom, M. & Skou, S. T., Apr 2024, In: SEMINARS IN ARTHRITIS AND RHEUMATISM. 65, p. 152390 10 p., 152390.

**Imaging Biomarkers of Osteoarthritis**

Roemer, F. W., Wirth, W. (Co-author), Demehri, S., Kijowski, R., Jarraya, M., Hayashi, D., Eckstein, F. (Co-author) & Guermazi, A., Feb 2024, In: SEMINARS IN MUSCULOSKELETAL RADIOLOGY. 28, 01, p. 14-25 12 p.

**The Impact of Exercise Training and Supplemental Oxygen on Peripheral Muscles in Chronic Obstructive Pulmonary Disease: A Randomized Controlled Trial**

Neunhäuserer, D., Hudelmaier, M. (Co-author), Niederseer, D. (Co-author), Vecchiato, M., Wirth, W. (Co-author), Steidle-Kloc, E. (Co-author), Kaiser, B., Lamprecht, B., Ermolao, A., Studnicka, M. (Co-author) & Niebauer, J. (Last author), 1 Dec 2023, In: MEDICINE AND SCIENCE IN SPORTS AND EXERCISE . 55, 12, p. 2123-2131 9 p.

**Selection of Knees With Subsequent Cartilage Thickness Loss Based on Magnetic Resonance Imaging Semiquantitative Grading: Data From the Osteoarthritis Initiative Foundation for the National Institutes of Health Biomarker Cohort.**

Wirth, W. (First author), Maschek, S., Wissner, A. (Co-author), Guermazi, A., Hunter, D. J., Kwok, C. K., Nevitt, M. C., Eckstein, F. (Co-author) & Roemer, F. W., Aug 2023, In: ARTHRITIS CARE & RESEARCH. 75, 8, p. 1773-1782 10 p.

**Quantitative CT of the knee in the IMI-APPROACH osteoarthritis cohort: Association of bone mineral density with radiographic disease severity, meniscal coverage and meniscal extrusion.**

Heiss, R., Laredo, J.-D., Wirth, W. (Co-author), Jansen, M. P., Marijnissen, A. C. A., Lafeber, F., Lalande, A., Weinans, H. H., Blanco, F. J., Berenbaum, F., Kloppenburg, M., Haugen, I. K., Engelke, K. & Roemer, F. W., Mar 2023, In: BONE . 168, p. 116673

**Worsening of Articular Tissue Damage as Defined by Semi-Quantitative MRI Is Associated With Concurrent Quantitative Cartilage Loss Over 24 Months.**

Roemer, F., Maschek, S., Wissner, A. (Co-author), Guermazi, A., Hunter, D., Eckstein, F. (Co-author) & Wirth, W. (Last author), Mar 2023, In: Cartilage. 14, 1, p. 39-47 9 p.

**Test-retest precision and longitudinal cartilage thickness loss in the IMI-APPROACH cohort.**

Wirth, W. (First author), Maschek, S., Marijnissen, A. C. A., Lalande, A., Blanco, F. J., Berenbaum, F., van de Stadt, L. A., Kloppenburg, M., Haugen, I. K., Ladel, C. H., Bacardit, J., Wissner, A. (Co-author), Eckstein, F. (Co-author), Roemer, F. W., Lafeber, F. P. J. G., Weinans, H. H. & Jansen, M., Feb 2023, In: OSTEOARTHRITIS AND CARTILAGE . 31, 2, p. 238-248 11 p.

**Association between knee magnetic resonance imaging markers and knee symptoms over 6-9 years in young adults.**

Singh, A., Venn, A., Blizzard, L., March, L., Eckstein, F. (Co-author), Jones, G., Wirth, W. (Co-author), Cicuttini, F., Ding, C. & Antony, B., 2023, In: RHEUMATOLOGY .

**Association of quantitative measures of medial meniscal extrusion with structural and symptomatic knee osteoarthritis progression - Data from the OAI FNIH biomarker study.**

Sharma, K., Eckstein, F. (Co-author), Maschek, S., Roth, M. (Co-author), Hunter, D. J. & Wirth, W. (Last author), 2023, In: OSTEOARTHRITIS AND CARTILAGE . 31, 10, p. 1396-1404

**Comparison of evaluation metrics of deep learning for imbalanced imaging data in osteoarthritis studies.**

Liu, S., Roemer, F., Ge, Y., Bedrick, E. J., Li, Z.-M., Guermazi, A., Sharma, L., Eaton, C., Hochberg, M. C., Hunter, D. J., Nevitt, M. C., Wirth, W. (Co-author), Kent Kwok, C. & Sun, X., 2023, In: OSTEOARTHRITIS AND CARTILAGE . 31, 9, p. 1242-1248

**Evaluation of S201086/GLPG1972, an ADAMTS-5 inhibitor, for the treatment of knee osteoarthritis in ROCCELLA: a phase 2 randomized clinical trial.**

Schnitzer, T., Pueyo, M., Deckx, H., van der Aar, E., Bernard, K., Hatch, S., van der Stoep, M., Grankov, S., Phung, D., Imbert, O., Chimits, D., Muller, K., Hochberg, M. C., Bliddal, H., Wirth, W. (Co-author), Eckstein, F. (Co-author) & Conaghan, P. G., 2023, In: OSTEOARTHRITIS AND CARTILAGE . 31, 7, p. 985-994

**Exploring the differences between radiographic joint space width and MRI cartilage thickness changes using data from the IMI-APPROACH cohort.**

Jansen, M. P., Roemer, F. W., Marijnissen, A. K. C. A., Kloppenburg, M., Blanco, F. J., Haugen, I. K., Berenbaum, F., Lafeber, F. P. J. G., Welsing, P. M. J., Mastbergen, S. C. & Wirth, W. (Last author), 2023, In: SKELETAL RADIOLOGY . 52, 7, p. 1339-1348

**Joint-adjacent subcutaneous adipose tissue - An obesity-related imaging biomarker associated with structural osteoarthritis progression?**

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**Machine-learning predicted and actual 2-year structural progression in the IMI-APPROACH cohort**

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**Quantitative measurement of cartilage morphology in osteoarthritis: current knowledge and future directions.**

Wirth, W. (First author), Ladel, C., Maschek, S., Wisser, A. (Co-author), Eckstein, F. (Co-author) & Roemer, F., 2023, In: SKELETAL RADIOLOGY . 52, 11, p. 2107-2122

**Which risk factors determine cartilage thickness and composition change in radiographically normal knees? - Data from the Osteoarthritis Initiative.**

Eckstein, F. (First author), Maschek, S., Culvenor, A. (Co-author), Sharma, L., Roemer, F. W., Duda, G. N. & Wirth, W. (Last author), 2023, In: Osteoarthritis and Cartilage Open. 5, 3, p. 100365

**Association between osteoarthritis-related serum biochemical markers over 11 years and knee MRI-based imaging biomarkers in middle-aged adults.**

Singh, A., Venn, A., Blizzard, L., Jones, G., Burgess, J., Parameswaran, V., Cicuttini, F., March, L., Eckstein, F. (Co-author), Wirth, W. (Co-author), Ding, C. & Antony, B., 2022, In: OSTEOARTHRITIS AND CARTILAGE . 30, 5, p. 756-764

**Association of Superficial Cartilage Transverse Relaxation Time With Osteoarthritis Disease Progression: Data From the Foundation for the National Institutes of Health Biomarker Study of the Osteoarthritis Initiative.**

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**Detection of Differences in Longitudinal Cartilage Thickness Loss Using a Deep-Learning Automated Segmentation Algorithm: Data From the Foundation for the National Institutes of Health Biomarkers Study of the Osteoarthritis Initiative.**

Eckstein, F. (First author), Chaudhari, A. S., Fuerst, D. (Co-author), Gaisberger, M. (Co-author), Kemnitz, J. (Co-author), Baumgartner, C. F., Konukoglu, E., Hunter, D. J. & Wirth, W. (Last author), 2022, In: ARTHRITIS CARE & RESEARCH. 74, 6, p. 929-936

**Imaging in Osteoarthritis.**

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**Local MRI-based measures of thigh adipose tissue derived from fully automated deep convolutional neural network-based segmentation show a comparable responsiveness to bidirectional change in body weight as from quality controlled manual segmentation.**

Kemnitz, J. (First author), Steidle-Kloc, E. (Co-author), Wirth, W. (Co-author), Fuerst, D. (Co-author), Wisser, A. (Co-author), Eder, S. (Co-author) & Eckstein, F. (Last author), 2022, In: ANNALS OF ANATOMY-ANATOMISCHER ANZEIGER . 240, p. 151866

**Longitudinal Relationship Between Tibiofemoral Contact Stress at Baseline and Worsening of Knee Pain Over 84 Months in the Multicenter Osteoarthritis Study.**

Rabe, K. G., Stockman, T. J., Kern, A. M., Wirth, W. (Co-author), Eckstein, F. (Co-author), Sharma, L., Lynch, J. A., Nevitt, M. C., Anderson, D. D. & Segal, N. A., 2022, In: AMERICAN JOURNAL OF PHYSICAL MEDICINE & REHABILITATION. 101, 8, p. 726-732

**Meniscus position and size in knees with versus without structural knee osteoarthritis progression: data from the osteoarthritis initiative.**

Sharma, K., Eckstein, F. (Co-author), Wirth, W. (Co-author) & Emmanuel, K. (Last author), 2022, In: SKELETAL RADIOLOGY . 51, 5, p. 997-1006

**Muscle weakness is associated with non-contractile muscle tissue of the vastus medialis muscle in knee osteoarthritis.**

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**Response letter to the Editor.**

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**Responsiveness of Subcutaneous Fat, Intermuscular Fat, and Muscle Anatomical Cross-Sectional Area of the Thigh to Longitudinal Body Weight Loss and Gain: Data from the Osteoarthritis Initiative (OAI).**

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**Sprifermin for Treatment of Osteoarthritis: Recombinant Fibroblast Growth Factor 18 as a Possible Disease-Modifying Knee Osteoarthritis Drug**

Jakab, M. (First author), Kiesslich, T. (Co-author), van der Zee-Neuen, A. (Co-author), Wirth, W. (Co-author) & Ritter, M. (Last author), 2022, In: Paracelsus Proceedings of Experimental Medicine.

**Structural tissue damage and 24-month progression of semi-quantitative MRI biomarkers of knee osteoarthritis in the IMI-APPROACH cohort.**

Roemer, F. W., Jansen, M., Marijnissen, A. C. A., Guermazi, A., Heiss, R., Maschek, S., Lalande, A., Blanco, F. J., Berenbaum, F., van de Stadt, L. A., Kloppenburg, M., Haugen, I. K., Ladel, C. H., Bacardit, J., Wisser, A. (Co-author), Eckstein, F. (Co-author), Lafeber, F. P. J. G., Weinans, H. H. & Wirth, W. (Last author), 2022, In: BMC MUSCULOSKELETAL DISORDERS. 23, 1, p. 988

**Accuracy and longitudinal reproducibility of quantitative femorotibial cartilage measures derived from automated U-Net-based segmentation of two different MRI contrasts: data from the osteoarthritis initiative healthy reference cohort.**

Wirth, W. (First author), Eckstein, F. (Co-author), Kemnitz, J. (Co-author), Baumgartner, C. F., Konukoglu, E., Fuerst, D. (Co-author) & Chaudhari, A. S., 2021, In: MAGNETIC RESONANCE MATERIALS IN PHYSICS BIOLOGY AND MEDICINE. 34, 3, p. 337-354

**A simple inclusion criteria combination increases the rate of cartilage loss in patients with knee osteoarthritis**

Imbert, O., Chimits, D., Guedj, M., Lorieau, F., Bernard, K., Lalande, A., Wirth, W., Eckstein, F. & Peuyo, M., 2021, In: Osteoarthritis and Cartilage Open. 3, 3, p. 100188-100188

**Cartilage collagen structure upon knee joint distraction and high tibial osteotomy as measured with T2-mapping MRI - post-hoc analyses of two RCTs**

Jansen, M., Mastbergen, S., Wirth, W., Spruijt, S., Custers, R., Van Heerwaarden, R. & Lafeber, F., 2021, In: Osteoarthritis Imaging. 1, p. 100004

**Changes in Cartilage Thickness and Denuded Bone Area after Knee Joint Distraction and High Tibial Osteotomy-Post-Hoc Analyses of Two Randomized Controlled Trials**

Jansen, M., Maschek, S., van Heerwaarden, R., Mastbergen, S., Wirth, W. (Co-author), Lafeber, F. & Eckstein, F. (Last author), 2021, In: Journal of Clinical Medicine. 10, 2, p. 368

**Changes in Medial Meniscal Three-Dimensional Position and Morphology As Predictors of Knee Replacement in Rapidly Progressing Knee Osteoarthritis: Data From the Osteoarthritis Initiative.**

Roth, M. (First author), Emmanuel, K. (Co-author), Wirth, W. (Co-author), Kwok, C. K., Hunter, D. J., Hannon, M. J. & Eckstein, F. (Last author), 2021, In: ARTHRITIS CARE & RESEARCH. 73, 7, p. 1031-1037

**Do Ahlbäck scores identify subgroups with different magnitudes of cartilage thickness loss in patients with moderate to severe radiographic osteoarthritis? One-year follow-up data from the Osteoarthritis Initiative**

Hangaard, S., Boesen, M., Bliddal, H. & Wirth, W., 2021, In: SKELETAL RADIOLOGY .

**Early anterior cruciate ligament reconstruction does not affect 5 year change in knee cartilage thickness: secondary analysis of a randomized clinical trial.**

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**Efficacy and cost-effectiveness of Stem Cell injections for symptomatic relief and structural improvement in people with Tibiofemoral knee Osteoarthritis: protocol for a randomised placebo-controlled trial (the SCULPTOR trial)**

Liu, X., Robbins, S., Wang, X., Virk, S., Schuck, K., Deveza, L., Oo, W., Carmichael, K., Antony, B., Eckstein, F. (Co-author), Wirth, W. (Co-author), Little, C., Linklater, J., Harris, A., Humphries, D., OxxxConnell, R., Heller, G., Buttler, T., Lohmander, S. & Ding, C. & 1 others, Hunter, D., 2021, In: BMJ OPEN. 11, 11, p. e056382

**Impact of Diabetes Mellitus on Knee Osteoarthritis Pain and Physical and Mental Status: Data From the Osteoarthritis Initiative.**

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**Is Lamellar Cartilage Composition as Determined by T2 Relaxometry Associated with Incident and Worsening of Cartilage or Bone Marrow Abnormalities?**

Roemer, F. W., Eckstein, F. (Co-author), Duda, G., Guermazi, A., Maschek, S., Sharma, L. & Wirth, W. (Last author), 2021, In: Cartilage. 13, 1\_suppl, p. 757S-766S

**Longitudinal Change in Knee Cartilage Thickness and Function in Subjects with and without MRI-Diagnosed Cartilage Damage.**

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Eckstein, F. (First author), Wirth, W. (Co-author) & Culvenor, A. (Last author), 2021, In: OSTEOARTHRITIS AND CARTILAGE . 29, 2, p. 170-179

**The design of a randomized, placebo-controlled, dose-ranging trial to investigate the efficacy and safety of the ADAMTS-5 inhibitor S201086/GLPG1972 in knee osteoarthritis**

Imbert, O., Deckx, H., Bernard, K., van der Aar, E., Pueyo, M., Saeed, N., Fuerst, T., Wirth, W., Conaghan, P. & Eckstein, F., 2021, In: Osteoarthritis and Cartilage Open. 3, 4, p. 100209-100209

**The effects of sprifermin on symptoms and structure in a subgroup at risk of progression in the FORWARD knee osteoarthritis trial.**

Guehring, H., Moreau, F., Daelken, B., Ladel, C., Guenther, O., Bihlet, A. R., Wirth, W. (Co-author), Eckstein, F. (Co-author), Hochberg, M. & Conaghan, P. G., 2021, In: SEMINARS IN ARTHRITIS AND RHEUMATISM. 51, 2, p. 450-456

**Association of infra-patellar fat pad size with age and body weight in children and adolescents.**

Ladenhauf, H. N. (First author), Schlattau, A. (Co-author), Burda, B., Wirth, W. (Co-author), Eckstein, F. (Co-author), Metzger, R. P. (Co-author) & Ruhdorfer, A. (Last author), 2020, In: ANNALS OF ANATOMY-ANATOMISCHER ANZEIGER . 232, p. 151533

**Clinical evaluation of fully automated thigh muscle and adipose tissue segmentation using a U-Net deep learning architecture in context of osteoarthritic knee pain**

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**Frequencies of MRI-detected structural pathology in knees without radiographic OA and worsening over three years: How relevant is contralateral radiographic osteoarthritis?**

Roemer, F., Eckstein, F. (Co-author), Duda, G., Guermazi, A., Maschek, S., Sharma, L. & Wirth, W. (Last author), 2020, In: Osteoarthritis and Cartilage Open.

**Intra-articular sprifermin reduces cartilage loss in addition to increasing cartilage gain independent of location in the femorotibial joint: post-hoc analysis of a randomised, placebo-controlled phase II clinical trial.**

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**Layer-specific analysis of femorotibial cartilage t2 relaxation time based on registration of segmented double echo steady state (dess) to multi-echo-spin-echo (mese) images.**

Fürst, D., Wirth, W. (Co-author), Chaudhari, A. & Eckstein, F. (Last author), 2020, In: MAGNETIC RESONANCE MATERIALS IN PHYSICS BIOLOGY AND MEDICINE. 33, 6, p. 819-828

**Longitudinal changes in location-specific cartilage thickness and T2 relaxation-times after posterior cruciate ligament reconstruction for isolated and multiligament injury.**

Culvenor, A. (First author), Wirth, W. (Co-author), Boeth, H., Duda, G. N. & Eckstein, F. (Last author), 2020, In: CLINICAL BIOMECHANICS . 79, p. 104935

**Reduction in Thigh Muscle Strength Occurs Concurrently but Does Not Seem to Precede Incident Knee Pain in Women: Data From the Osteoarthritis Initiative Cohort.**

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**The effect of weight loss on the progression of meniscal extrusion and size in knee osteoarthritis: a post-hoc analysis of the Intensive Diet and Exercise for Arthritis (IDEA) trial.**

Munugoda, I. P., Beavers, D. P., Wirth, W. (Co-author), Aitken, D. A., Loeser, R. F., Miller, G. D., Lyles, M., Carr, J. J., Guermazi, A., Hunter, D. J., Messier, S. P. & Eckstein, F. (Last author), 2020, In: OSTEOARTHRITIS AND CARTILAGE . 28, 4, p. 410-417

**Association between changes in molecular biomarkers of cartilage matrix turnover and changes in knee articular cartilage: a longitudinal pilot study.**

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**Association of adiposity measures in childhood and adulthood with knee cartilage thickness, volume and bone area in young adults.**

Meng, T., Venn, A., Eckstein, F. (Co-author), Wirth, W. (Co-author), Cicuttini, F., March, L., Dwyer, T., Cross, M., Laslett, L. L., Jones, G., Ding, C. & Antony, B., 2019, In: INTERNATIONAL JOURNAL OF OBESITY . 43, 7, p. 1411-1421

**Baseline structural tissue pathology is not strongly associated with longitudinal change in transverse relaxation time (T2) in knees without osteoarthritis.**

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