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What the Papers Say

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The *Journal of Hip Preservation Surgery* (*JHPS*) is not the only place where work in the field of hip preservation can be published. Although our aim is to offer the best of the best, we are continually fascinated by work, which finds its way into journals other than our own. There is much to learn from it, and so *JHPS* has selected six recent and topical subjects for those who seek a summary of what is taking place in our ever-fascinating world of hip preservation. What you see here are the mildly edited abstracts of the original articles, to give them what *JHPS* hopes is a more readable feel. If you are pushed for time, what follows should take you no more than 10 min to read. So here goes . . .

GENES ASSOCIATED WITH INFLAMMATION AND BONE REMODELING ARE HIGHLY EXPRESSED IN THE BONE OF PATIENTS WITH THE EARLY-STAGE CAM-TYPE FEMOROACETABULAR IMPINGEMENT

The authors from Peking University, Third Hospital [1] report that recent studies have shown high expression levels of certain inflammatory, anabolic and catabolic genes in the articular cartilage from the impingement zone of the hips with femoroacetabular impingement (FAI) representing an increased metabolic state. Nevertheless, little is known about the molecular properties of bone tissue from the impingement zone of hips with FAI.

They collected the bone tissue samples from patients with early-stage cam-type FAI during hip arthroscopy for treatment of cam-type FAI. Control bone tissue samples were collected from six patients who underwent total hip replacement because of a femoral neck fracture. Quantitative real-time polymerase chain reaction (PCR) was performed to determine the gene expression associated with inflammation and bone remodeling. The differences in the gene expression in bone tissues from the patients with early-stage cam-type FAI were also evaluated based on clinical parameters.

The authors included all of the 12 patients with early-stage cam-type FAI and six patients in the control group in this study. Compared to the control samples, the bone tissue samples from patients with FAI showed higher expression levels of interleukin-6 (IL-6), alkaline phosphatase (ALP), receptor activator of nuclear factor-kB ligand and osteoprotegerin ($P < 0.05$). IL-1 expression was detected only in the control group. On the other hand, there was no significant difference in IL-8 expression between the patients with FAI and the control group. The patients with FAI having a body mass index (BMI) of $>24\,kg/m^2$ showed higher ALP expression. Furthermore, the expression of IL-6 and ALP was higher in the patients with FAI in whom the lateral center-edge angle was $>30^\circ$.

Their results thus indicated that the metabolic condition of bone tissues in patients with early-stage cam-type FAI differed from that of normal bone in the femoral head-neck junction. The expression levels of the genes associated with inflammation and bone remodeling were higher in the bone tissue of patients with early-stage cam-type FAI than in the patients with normal bone tissue.

BIOCHEMICAL MRI WITH dGEMRIC CORRESPONDS TO 3D CT-BASED IMPINGEMENT LOCATION FOR DETECTION OF ACETABULAR CARTILAGE DAMAGE IN FAI PATIENTS

In this level 2 cohort study, Lerch *et al.* [2] from Bern, Switzerland noted that anterior FAI is associated with labral tears and acetabular cartilage damage in athletic and young patients. Delayed gadolinium-enhanced magnetic resonance imaging of cartilage (dGEMRIC) is an imaging method for detecting early damage to cartilage.

They evaluated three questions: first, what is the sensitivity and specificity of morphological magnetic resonance imaging (MRI) and dGEMRIC for detecting cartilage damage? Second, do they mean acetabular and femoral dGEMRIC indices differ between the superior acetabular

clock positions with and without impingement? Third, do they differ between the cam- and pincer-type FAI?

In this retrospective comparative study of 21 hips (20 patients with symptomatic anterior FAI) without osteoarthritis on anteroposterior radiographs, morphological MRI and dGEMRIC [3.0-T, 3-dimensional (3D) T1 maps, dual-flip angle technique] of the same hip joint were compared. Intra-operative acetabular cartilage damage was assessed in patients who underwent surgical treatment. Computed tomography (CT)-based 3D bone models of the same hip joint were used as the gold standard for the detection of impingement, and dGEMRIC indices and zones of morphologic damage were compared with the CT-based impingement zones.

Of the 21 hips, 10 had cam-type FAI and 8 had pincer-type FAI according to the radiographs. The mean age was 30 years (range 17–48 years), 71% were female, and surgical treatment was performed in 52%. The authors found that a significantly higher sensitivity (69%) for dGEMRIC compared with morphological MRI (42%) in the detection of cartilage damage. The specificity of dGEMRIC was 83% and accuracy was 78%. The mean peripheral acetabular and femoral dGEMRIC indices for clock positions with impingement (485 ± 141 and 440 ± 121 ms) were significantly lower compared with clock positions without impingement (596 ± 183 and 534 ± 129 ms). Hips with cam-type FAI had significantly lower acetabular dGEMRIC indices compared with hips with pincer-type FAI on the anterosuperior clock positions (1–3 o'clock).

The authors concluded that MRI with dGEMRIC was more sensitive than morphological MRI, and lower dGEMRIC values were found for clock positions with impingement as detected on 3D CT. They felt that it could aid in patient-specific diagnosis of FAI, pre-operative patient selection and surgical decision-making to identify patients with cartilage damage who are at risk for inferior outcomes after hip arthroscopy.

INCIDENCE OF HIP DYSPLASIA DIAGNOSIS IN YOUNG PATIENTS WITH HIP PAIN: A GEOGRAPHIC POPULATION COHORT ANALYSIS

The authors from the Mayo Clinic, Minnesota, USA [3] report that hip dysplasia is a common source of hip pain and a known cause of early osteoarthritis of the hip. The purpose of their cross-sectional study was first, to define the population-based incidence of hip dysplasia diagnosis in young patients presenting with hip pain in a large geographically defined cohort, second, to analyze trends regarding presentation and diagnosis of hip dysplasia and third, to report the rate and type of surgical interventions used to treat this population.

The authors queried a geographic epidemiological database to identify patients aged 14–50 years with hip pain between the years 2000 and 2016. Patient medical records were analyzed, and demographic, imaging, clinical and treatment history were recorded. Incidence trends were examined by use of linear regression with confidence intervals for age and calendar year.

Overall, 1893 patients were included. Of these, 156 patients (196 hips) had a diagnosis of hip dysplasia. The incidence of hip dysplasia diagnosis in patients who reported hip pain was 12.7 per 100 000 person-years. Patients with dysplasia had a mean age of 26.7 ± 9.8 years, while the highest age-adjusted incidence occurred at age 14–18 years in both male and female patients. Female patients had double the age-adjusted incidence of male patients [cases per 100 000 person-years: 16.8 (95% CI 13.9–19.7) vs 8.7 (95% CI 6.6–10.8)]. Of the patients who underwent MRI, 77% had imaging consistent with labral pathology. Patients were treated with physical therapy (67%), intra-articular steroid injection (29%), hip arthroscopy (10%) and periacetabular osteotomy (9%). The use of hip arthroscopy significantly increased over time, whereas the use of steroid injection and periacetabular osteotomy did not.

They concluded that the incidence of hip dysplasia diagnosis in patients presenting with hip pain was 12.7 per 100 000 person-years. Female patients had twice the age-adjusted incidence of male patients, and the highest age-adjusted incidence occurred in the age range of 14–18 years in both sexes. The use of hip arthroscopy to treat patients with hip dysplasia significantly increased over time.

HIP ARTHROSCOPY FOLLOWING SLIPPED CAPITAL FEMORAL EPIPHYSIS FIXATION: CHONDRAL DAMAGE AND LABRAL TEARS FINDINGS

In this descriptive retrospective study, the authors from Chile [4] investigated the association between chondrolabral damage and time to arthroscopic surgery for slipped capital femoral epiphysis (SCFE). They enrolled patients with SCFE who underwent hip arthroscopy for femoral osteochondroplasty after SCFE fixation. SCFE type, time from SCFE symptom onset or slip fixation surgery to hip arthroscopy and intra-articular arthroscopic findings were recorded. Acetabular chondrolabral damage was evaluated according to the Konan and Outerbridge classification systems. Nested analysis of variance and the chi-squared test was used for statistical analyses.

The authors analyzed 22 cases of SCFE in 17 patients. The mean age at the time of hip arthroscopy was 13.6 years (8–20), and mean time from SCFE fixation to arthroscopy was 25.1 months (3 weeks to 8 years). Labral frying was present in 20 cases, labral tears in 16 and acetabular chondral damage in 17 cases. The most frequent lesion was type 3 (41%) (Konan classification). Two cases had a grade III and one had a grade II acetabular chondral lesion (Outerbridge classification). Positive associations were observed between time from SCFE to hip arthroscopy and hip intra-articular lesions evaluated using Konan and Outerbridge classification systems. There was no association between SCFE severity, stability or temporality type and hip intra-articular lesions. The authors concluded that the longer time from SCFE symptom onset and fixation to hip arthroscopy is associated with greater acetabular chondrolabral damage.

ELEVATED LEVELS OF TNF-A, IL-1B AND IL-6 IN THE SYNOVIAL TISSUE OF PATIENTS WITH LABRAL TEAR: A COMPARATIVE STUDY WITH HIP OSTEOARTHRITIS

In this study from Japan, Koyama *et al.* [5] note that a labral tear can be the initiating factor in the onset of hip osteoarthritis (HOA). However, the physiopathology of a labral tear is not fully understood. Their aim was to compare synovial tissue inflammatory cytokine levels between patients with labral tear and late-stage HOA.

Synovial tissue from sites showing the greatest inflammation was harvested from 106 hips from 100 subjects during hip surgery. RNA was extracted, and levels of TNF-A, IL-1B, IL-6 and COX2mRNA were compared among all patients using real-time PCR. Additionally, the authors examined whether FAI was associated with elevated levels of inflammatory cytokines in patients with labral tear. To analyze the effects of TNF-α on inflammatory mediators in hip synovial tissue, synovial fibroblasts were extracted from hip synovial tissue of patients with labral tear and late-stage HOA ($n = 5$ each). Mononuclear cells were extracted from synovial tissue, cultured for 7 days and stimulated with control or 10 ng/mL human recombinant TNF-α for 1 day. mRNA was extracted from stimulated cells and IL-1B, IL-6 and COX2 levels were determined using real-time PCR.

The authors reported that the TNF-A, IL-1B and COX2 expression in synovial tissue were significantly higher in patients with labral tear than late-stage HOA. There were no differences in expression between patients with labral tear with and without FAI. Compared to vehicle control, TNF-α stimulation significantly elevated IL-1B, IL-6 and COX2 expression in synovial fibroblasts collected from patients with labral tear and late-stage HOA.

In summary, the authors concluded that the TNF-A, IL-1B and COX2 expression were elevated in the synovial tissue of patients with labral tear. They pointed out that further investigations were needed to reveal the relationship between inflammatory cytokine levels and various aspects of labral tear pathology, including pain and the onset and progression of osteoarthritis (OA).

BONE MARROW CONCENTRATE INJECTION TREATMENT IMPROVES SHORT-TERM OUTCOMES IN SYMPTOMATIC HOA PATIENTS: A PILOT STUDY

The authors from the Steadman Clinic, Vail, Colorado, USA [6] state that OA is one of the leading causes of disability in the United States, the hip being the second most affected weight-bearing joint. Autologous bone marrow concentrate (BMC) is a promising alternative therapy to conventional treatments, with the potential to mitigate inflammation and improve joint function. They investigated the effectiveness of a single intra-articular BMC injection for patients with symptomatic HOA.

A total of 24 patients diagnosed with symptomatic HOA who elected to undergo a single BMC injection were prospectively enrolled in the study. Patients were excluded if they reported a pre-injection Numeric Rating Scale (NRS) score for pain with activity of <6 points out of 10. The Western Ontario and McMaster Universities Arthritis Index (WOMAC), modified Harris Hip Score (mHHS), Hip Outcome Score–Activities of Daily Living (HOS-ADL), 12-Item Short Form Health Survey (SF-12) and NRS pain scores were collected before and after the procedure (6 weeks, 3 months and 6 months). Joint space and Tönnis OA grade scores were recorded on preinjection anteroposterior pelvis radiographs.

A total of 18 hips from 16 patients (7 male and 9 female) with a mean age of 57.6 years (±11); mean BMI, 25.9 (±3.6) kg/m^2 were used in the final analysis. Significant improvements were observed in NRS pain with activity (from 8 to 4.5) and without activity (from 5 to 1), WOMAC (from 31 to 16), mHHS (from 63 to 80) and HOS-ADL (from 71 to 85) over 6 months. At 6 months, all patients maintained their improvements and did not return to pre-procedure status. BMI significantly correlated with baseline WOMAC scores and inversely correlated with 6-month SF-12 Physical Component Summary. Tönnis grades 2 and 3 were inversely correlated with 6-week SF-12 Mental Component Summary and 3-month pain with activity ($P = 0.032$). No serious

adverse events were reported from the BMC harvest or injection procedure.

The authors concluded that a single BMC injection can significantly improve subjective pain and function scores up to 6 months in patients with symptomatic HOA. They felt that further studies are warranted to evaluate BMC treatment against other therapeutics in a larger sample size and compare the biological signature profiles that may be responsible for the therapeutic effect.

CONFLICT OF INTEREST STATEMENT

None declared.

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