

pain), which is a patient-oriented outcome measure for knee OA with sufficient reliability and validity, similar to WOMAC and SF-36, was also used to evaluate pain severity and activity of daily living. Both Spearman's rank correlation analysis and partial correlation analyses adjusted for age and BMI were conducted to examine the relationships between the severity of depression and the several clinical manifestations of the patients with knee OA. The several clinical manifestations were compared using parametric comparisons analysis of variance (ANOVA). Significant differences were evaluated if ANOVA was significant. A *p*-value of less than 0.05 was considered to be statistically significant.

**Results:** Pain VAS score and JKOM scores of the patients were increased dependent upon the severity of knee OA. However, SDS score, serum levels of both IL-6 and hs-CRP were not associated with the severity of knee OA. There was positive correlation between SDS score and pain VAS score ( $r = 0.28, p < 0.001$ ) and JKOM-pain score ( $r = 0.29, p < 0.001$ ). Serum levels of IL-6 were also correlated with SDS score ( $r = 0.18, p = 0.003$ ), while no correlation was observed between SDS score and serum levels of hs-CRP ( $r = 0.10, p = 0.22$ ). Furthermore, age and BMI adjusted partial correlation analysis also showed the positive correlations between SDS score and serum IL-6 ( $r = 0.25, p = 0.002$ ), pain VAS score ( $r = 0.26, p = 0.002$ ) and JKOM-pain score ( $r = 0.26, p = 0.002$ ). No significant correlations were observed between SDS score and serum levels of hs-CRP ( $r = 0.10, p = 0.24$ ) by the age and BMI adjusted partial correlation analysis.

**Conclusions:** The results of the current study indicate that there is an association between the severity of depression and the severity of pain in patients with knee OA. Furthermore, the severity of depression is associated with the severity of inflammation. Serum levels of IL-6 are reflected to the severity of synovitis and associated with pain in patients with knee OA. In addition, serum levels of IL-6 have been reported to be a predictor for the onset of depression. Based on these results, the severity of depression may be affected by the severity of synovitis in patients with knee OA. In conclusion, there is an association between the severity of depression and the serum levels of IL-6 in patients with knee OA.

#### 743

### NEUROPATHIC AND PSYCHOLOGICAL FACTORS IN SYMPTOMATIC PATIENTS WITH HIP DISEASES: COMPARISON BETWEEN OSTEOARTHRITIS, FEMOROACETABULAR IMPINGEMENT AND HIP DYSPLASIA

T. Nishii, T. Sakai, M. Takao, S. Tamura, H. Hamada, N. Sugano. *Osaka Univ. Med. Sch., Osaka, Japan*

**Purpose:** Osteoarthritis of the hip with advanced changes on radiographs is widely accepted as the leading cause of significant symptom and functional disability in the hip joint. Without radiographic evidence of osteoarthritis, hip dysplasia (HD) and femoroacetabular impingement (FAI) are also recognized as relevant causes of hip symptom and targets of surgical interventions. Reliable correlations between hip symptom and radiographic osteoarthritis were established, however, accurate diagnosis in non-osteoarthritic FAI and HD as true source of hip symptom is challenging, due to unspecific manifestations of symptom and lack of established associations with labral or cartilage damages. Without accurate assessment of source of hip symptom, pharmacological or surgical treatments for those pathologies may result in unfavorable outcomes.

Recent multi-discipline approaches showed that damage or dysfunction of the nerve system (neuropathic mechanism) and psychological problems are partly associated with low back and knee pain. Our objective was to examine associations of neuropathic and psychological factors in symptomatic FAI and HD patients as possible causes of hip symptom, using osteoarthritis (OA) patients as reference.

**Methods:** Consecutive 98 symptomatic patients including hip OA ( $N = 50$ ) at the Kellgren–Lawrence (KL) grade of 2 or more, non-osteoarthritic HD ( $N = 30$ ), and non-arthritic FAI ( $N = 18$ ) on radiographs were studied. Patients with history of hip surgeries, acute traumatic events, suspicion of infection or tumorous diseases, and neuromuscular diseases were excluded. In hip OA patients, there were 9 hips at the KL grade of 2, 14 hips at the KL grade of 3, and 27 hips at the KL grade of 4. In HD patients, mean center-edge (CE) angle on radiographs was  $16 \pm 8.6$  degrees. In FAI patients, there were 9 cam-type hips, 6 pincer-type

hips, and 3 mixed-type hips. Visual Analogue Scales of pain (VAS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Brief Scale for Psychiatric problems in Orthopaedic Patients (BS-POP) for psychological assessment, and the Neuropathic Pain Screening Questionnaires (NPSQ) for neuropathic assessment were compared among the three groups.

**Results:** There were no significant differences of VAS, WOMAC pain and stiffness scores among the three groups. In the OA, HD, and FAI groups, psychological problems were indicated in 22%, 39%, and 37% of patients, and presence of neuropathic factors were highly suspicious in 10%, 10%, and 19% of patients. There was no significant difference regarding psychological problems and neuropathic factors among the three groups. In NPSQ, scores of “burning sensation” and “numbness” were relatively higher in the FAI group, as compared to the other two groups. In BS-POP, the scores of “specific way of indicating symptom by patients” and “pain over the whole symptomatic area” were significantly higher in the HD group, and the score of “patient's bad attitudes for recommendations of examination or treatment” was significantly higher in the FAI group, as compared with the OA group ( $p < 0.05$ ). VAS and WOMAC pain scores had mild correlations with NPSQ scores ( $r = 0.43–0.48, p < 0.001$ ).

**Conclusions:** Among symptomatic FAI and HD patients, over one-third had psychological factors and nearly one-seventh had neuropathic symptoms. In addition to surgical and exercise treatments, systematic treatment strategies incorporating medications and psychotherapy effective for neuropathic and psychological factors may be more important in non-osteoarthritic patients.

#### 744

### DEPRESSION COMPLICATED WITH KNEE OSTEOARTHRITIS

M. Tsuchiya †, H. Kurosawa †, Y. Shimura †, H. Kaneko ‡, L. Liu ‡, R. Sadatsuki ‡, Y. Anwarjan ‡, S. Hada ‡, M. Kinoshita ‡, Y. Makino ‡, M. Sawa †, Y. Iwase †, K. Kaneko ‡, M. Ishijima ‡. <sup>†</sup>*Juntendo Tokyo Koto Geriatric Med. Ctr., Tokyo, Japan;* <sup>‡</sup>*Juntendo Univ. Graduate Sch. of Med., Tokyo, Japan*

**Purpose:** The symptoms of knee osteoarthritis (OA) are often associated with significant functional impairment, symptoms of inflammation, including pain, stiffness, and loss of mobility, disability and diminished activity in daily life and a diminished overall quality of life for OA patients. There are no current interventions proven to restore cartilage or curtail the disease processes, and OA ultimately results in joint destruction, chronic pain, disability, and other associated conditions such as depression and social isolation. Depression is speculated to be related to pain in knee OA and may affect the outcomes of treatment for knee OA. While the pain severity and pain related factors in knee OA may change dependent upon the progression of the disease, it still remained unclear whether depression in patients with knee OA also change dependent upon the progression of the disease. The purpose of this study was to investigate both the prevalence and severity of depression among patients with knee OA and to clarify the relationship between depression and both the radiographic disease progression and the severity of pain in patients with knee OA.

**Methods:** A total of 250 patients (mean age 70.7 years) who consulted our out-patient clinic for knee pain between October 2009 and November 2012 were enrolled in this study. All patients had knee OA Kellgren–Lawrence (K/L) grade of 2 or more with no history of being examined for mental disorder. The Zung self-rating depression scale (SDS) was used to evaluate depression with scores greater than 40 indicating a state of depression. Patients were divided into the K/L 2 group (93 patients), K/L 3 group (79 patients) and the K/L 4 group (78 patients). After examining the relationship between the severities of knee OA and the presence or absence of depression, SDS score of these three groups was compared. Visual Analog Scale scores for pain (pain-VAS score) were then compared between the two groups divided according to the presence or absence of depression. Independence was tested using the chi-square test. While multiple comparisons between the three groups were performed using a Bonferroni test, a *t*-test was used for the comparisons between two groups. All statistical analyses were performed using the SPSS 21J software program.

**Results:** Pain VAS scores in patients with K/L 4 group were significantly increased in comparison to those in patients with K/L 2 and 3. The mean SDS score of all patients was 39.6 points and 127 of 250 patients with knee OA (50.8%) were complicated with depression. As the 50 patients with K/L 2 group (53.8%), 35 patients with K/L 3 group (44.3%) and 42 patients with K/L 4 group (53.8%) were complicated with depression, no significant difference for the prevalence of depression was observed between these three groups divided by the radiographic severities of knee OA (asymptotic  $p$ -value: 0.377). As mean SDS scores of each group were 39.9 points in K/L 2 group, 38.2 points in K/L 3 group and 40.8 points in K/L 4 group, no significant differences for the SDS scores were observed between these three groups. Pain-VAS score in the patients with depression (61.6 points) was significantly increased in comparison to that in those without depression (50.8 points) ( $p < 0.001$ ).

**Conclusion:** The current study revealed that approximately half of the patients with knee OA were complicated with depression. While no significant differences for both the prevalence and severity of depression were observed between the patients divided by the radiographic severity of knee OA, pain severity in patients with depression was significantly increased in comparison to that in those without depression, suggesting that depression complicated with knee OA is associated with the symptoms rather than the severity of the disease.

#### 745

##### ONGOING PAIN FOLLOWING KNEE REPLACEMENT. SIMPLE CLINICAL TOOLS TO GUIDE ASSESSMENT OF VARYING PAIN PROFILES

N.R. Howells †, J.R. Murray ‡, V. Wylde †, A.W. Blom †, P. Dieppe †. † *Univ. of Bristol, Bristol, United Kingdom*; ‡ *North Bristol Hosp. NHS Trust, Bristol, United Kingdom*

**Purpose:** Research has identified that approximately 20% of patients experience ongoing pain after knee replacement. Increasingly it is acknowledged that there is a complex interaction of multiple causative factors that contribute to a suboptimal outcome following knee replacement. It has been proposed that patients with ongoing pain can be characterised into one of a number of different pain profiles of common associative factors. This study aims to assess if distinct pain profiles can be determined and whether simple clinical tools can be used to guide a clinician to a possible profile.

**Methods:** A case controlled study comparing 100 patients with established ongoing pain following knee replacement to 200 pain free controls matched for age, gender, time from surgery and prosthesis was performed. Patients attended a research appointment and data was collected using self-report questionnaires and clinical assessment. Factors significantly and independently associated with ongoing pain were established from a case controlled binomial stepwise logistic regression analysis. These factors included proximal tibial tenderness, coronal plane instability, patellofemoral dysfunction, local allodynia and multiple other pain sites or pain diagnoses. Additional psychosocial factors were identified but excluded from this profiling study as they were deemed to influence pain regardless of other underlying associated factors and would be relevant in patients across all pain profiles. The 100 patients with ongoing pain were sub-grouped in multiple combinations based on presence or absence of 3 or 4 of the 5 factors found to be independently associated with ongoing pain. For determination of presence or absence of each of the 5 key associative factors in a given patient, a simple assessment tool was identified. The associative factor combination with the cleanest split of patients into different subgroupings was identified.

These groups were then compared, looking at a wide profile of assessed variables to determine if differences in the key associative factors led to more generalised differences in their overall profile. Comparison between subgroupings was made with one way ANOVA and Kruskal-Wallis Tests as appropriate.

**Results:** The combination of associative factors that gave the cleanest split of patients into different subgroupings was proximal tibial tenderness, coronal plane instability, local allodynia and multiple pain sites/ diagnoses. The simple assessment tool for each of these subgroupings was clinical palpation tenderness of the proximal tibia, coronal instability assessment in mid-flexion, brush allodynia

assessment for local allodynia, and >3 additional either reported sites of pain or diagnoses of pain conditions. The spread of the 100 patients across these subgroupings was: Pure Allodynia(18), Pure Tibial Tenderness(17), Pure Mid Flexion Coronal Instability(12), Pain Problem(19), Allodynia + Pain Problem(19), All of them(6), None of them(9). Significant differences were identified between subgroupings for a wide spread of assessed variables suggesting that differences in key associative factors did indicate more generalised differences in their overall pain profile.

**Conclusion:** Patients with ongoing pain following knee replacement pose a challenge for the assessing clinician, in part due to the complex interaction of multiple associative factors, which have varying relative contributions to pain in any given patient. This study begins to provide evidence for and early characterisation of the varying pain profiles in these patients. In addition it has identified simple assessment tools, easily performed in a clinic setting, which could guide a treating clinician to a patient's profile. A knowledge of the profile of associative factors linked to a particular patient's pain could then in the future guide a clinician to the need for further investigations, management and prognosis.

#### 746

##### PRE-OPERATIVE EXPERIMENTAL THERMAL SENSITIVITY PREDICTS OXFORD KNEE SCORE 1-YEAR POST-OPERATIVELY: A PRELIMINARY STUDY

A. Soni, S. Gwyllim, N. Arden, I. Tracey, A. Price, M. Javaid. *Univ. of Oxford, Oxford, United Kingdom*

**Purpose:** Approximately 20% of patients undergoing knee replacement surgery experience ongoing symptoms a year after surgery. With rising rates of osteoarthritis of the knee and associated arthroplasty, identifying patients who may experience a poor outcome following surgery is essential to inform clinical care as these patients may benefit from additional therapies prior to surgery, or may choose not to proceed with surgery. Preliminary evidence has suggested that pre-operative widespread pain sensitisation measured using pressure algometry may be associated with chronic pain after surgery. This study aimed to further explore the predictive role of Quantitative Sensory Testing (QST), using thermal modalities, with respect to knee replacement surgery.

**Methods:** Patients listed for knee replacement surgery for osteoarthritis of the knee were recruited from an Orthopaedic outpatient knee clinic. QST was conducted at the time of the pre-operative assessment clinic appointment. The following thresholds were measured at the sternum (distant site) and affected knee (local site): warm detect threshold, heat pain threshold, cold detection threshold and cold pain threshold. Demographic data were also collected at baseline and patients were asked to complete the Oxford Knee Score (OKS). Follow-up OKS data were collected at year-1 following surgery. Spearman's Rank Correlation was used to investigate any associations between individual pre-operative thermal sensory tests and post-operative OKS.

**Results:** Baseline and year-1 follow-up data were available for 20 participants included in this study. Participants included 9 females and 11 males with a mean age of 73 (12). The mean baseline and Year-1 follow-up OKS were 17.5 (6.4) and 36.7 (9.5) respectively. Of all the modalities tested, only cold detection threshold measured at the sternum (not the knee) was significantly ( $p = 0.019$ ) associated with post-operative Oxford Knee Score. A similar trend, which approached statistical significance, was seen with heat pain thresholds measured at the sternum, Figure 1.

**Conclusions:** This study adds to the emerging literature, which suggests that pre-operative experimental sensitivity may help to predict patient outcome following knee replacement surgery. The fact that measures taken at the sternum were predictors of post-operative outcome supports previous work showing that centrally mediated widespread pain sensitisation is present and an important predictive measure in this patient group. Although it might be expected that similar findings should also be seen at the affected site, this might not have been detected due to the effect of other peripherally mediated mechanisms. Further work is needed in larger patient groups so that the association can be tested with adjustment for potential confounding factors such as age, BMI and mood scores.