

example, they struggle to find the right balance between hiding and showing pain, and this has an impact on the struggle to affirm self. Our model showed that some were empowered to move forward alongside their pain by: listening to their body; finding a new self; becoming part of a community; telling others about pain; realising that pain is here to stay; becoming the expert.

**Conclusions:** Chronic MSK pain is experienced as a constant adversarial struggle. Our model calls on us to challenge cultural notions about illness, in particular, the expectation of achieving a diagnosis/cure. People with chronic MSK pain do not feel believed, and this can have an impact on participation in life. Central to the relationship between patient and practitioner is the recognition of a person whose life has been deeply changed. Our model suggests that feeling valued is not simply an adjunct to the therapy, but central to it. The implications for clinical practice will be presented.

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### SPECIFIC TISSUE LESIONS ASSOCIATED WITH PAIN AND DISABILITY IN EARLY STAGE OF KNEE OA

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**Purpose:** Current treatments for knee osteoarthritis (OA) are essentially treatments for symptoms, which consist mainly of pain and disability. It is important to further investigate the source of symptoms to treat OA optimally. To develop disease-modifying treatment for OA, an early treatment is required. Although, OA is traditionally considered to be a disease of the hyaline articular cartilage, OA is a process of the whole joint including cartilage, bone, intra- and periarticular structures. However, plain radiograph is relatively insensitive, it only provides a historical view of the skeletal damage that has already occurred, and it does not happen for the early joint damage. MRI has potential to fix these limitations of radiography. An important element in understanding symptoms is to know which structures produce inside the knee joint since the pathology of knee OA involves the whole knee joint. The aim of this study was to investigate the relationship between the symptoms and the structural abnormalities detected by MRI in early stage knee OA.

**Methods:** In this observation, 132 participants (female; 120, male; 12) with early stage of medial knee OA [Kellgren-Lawrence (K/L) grade of 1 and 2] were registered. All patients had complained of knee pain for the preceding month in the study. All subjects were performed both standing knee radiography and 3.0-T MRI. MRI scans were read using a standardized and validated method called the whole-organ MRI scoring method (WORMS), which is consisted of the specific features related to OA as below; [1] cartilage morphology, [2] bone marrow lesions (BML), [3] bone cysts, [4] bone attrition, [5] meniscal pathology and [6] osteophytes. Each parameter was semi-quantitatively scored in 10 tibio-femoral sub-regions. The patient-oriented outcome and health related quality of life (HRQL) of participants was measured by the Japanese Knee Osteoarthritis Measure (JKOM), which has proven to have sufficient reliability and validity by means of statistical evaluation and comparison with other health related scales, such as WOMAC and SF-36. The JKOM is a patient-based, self answering evaluation score that includes of 4 subcategories: category I; pain VAS, II; pain and stiffness, III; activities of daily living, IV; social activities, and V; general health conditions, with 100 points as the maximum score (II-V). It is higher in patients with more pain and physical disabilities. Since knee pain severity and JKOM have a skewed distribution, median pain severities were analyzed. The relationship between median pain severity and JKOM scores and MRI lesion scores was done by median quantile regression.

**Results:** The radiographic findings, such as K/L grade, JSW and FTA, were not necessarily correlated with clinical symptoms in patients with early stage medial knee OA. However, medial cartilage morphology scores were significantly associated with VAS scores (Coefficient 2.84, 95%CI; 1.06 to 4.62,  $p < 0.01$ ). Also, medial BML scores were associated with JKOM category III scores (Coefficient 2.12, 95%CI; 0.05 to 1.58,  $p = 0.04$ ). Next, the frequencies of occurrence of cartilage morphology and BMLs were examined to investigate their associations and order of appearance. Among 1780 parts in the knee joints examined of 133 patients, 48% (853 parts) of them showed negative for both cartilage lesion and BML, 38% (685 parts) showed positive for cartilage lesion and negative for BML, 11% (190 parts) for positive for both cartilage lesion and BML, and 3% (52 parts) showed negative for cartilage lesion and positive for BML.

**Conclusions:** In this study, the pain severity was found to be associated with the articular cartilage damage in the medial compartment of the early stage of knee OA. Even in the early stage of knee OA, patients complain the disability in daily life in accordance with the presence of BML. These MRI features should be considered as possible new treatments in knee OA.

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### EXPECTATIONS OF PAIN RELIEF IN PATIENTS WITH OSTEOARTHRITIS OF THE KNEE

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**Purpose:** The purpose of this study was to identify expectations of pain relief in patient with osteoarthritis of the knee. We hypothesized that most patients with osteoarthritis of the knee would consider pain relief a very important expectation and the level of expected pain relief would differ by the grade of osteoarthritis.

**Methods:** A cohort of 2688 patients (Average age = 54 (std dev. = 14); 1236 female & 1452 males), who were seeking treatment for knee pathology were studied prospectively. All patients had complete demographic data, WOMAC scores, health status (SF12), patient expectations, and Kellgren Lawrence (KL) grade collected at initial exam. Patient expectations were collected using a previously validated questionnaire. Inclusion criteria for the study was a KL of grade 1 or greater, 18 years of age or greater, and complete data. There were 31%(832) grade 1 KL, 30%(768) KL grade 2, 24% KL grade 3, and 17%(440) KL grade 4.

**Results:** 74%(1979) of all patients considered pain relief a very important expectation of treatment, 20% (546) considered it somewhat important and 6% considered it of little to no importance. There was no association between Kellgren Lawrence grade and expectation of pain relief.

10% (280) of patients expected some pain relief, 46%(1235) expected relief of most of the pain and 43% (1153) expected relief of all pain. There was an association between KL grade and expectation of amount of pain relief. 35% (153) of KL grade 4 patients expected relief of all pain, 39% (244) of patients with KL grade 3 expected relief of all pain, 44% of patients with KL grade 2 expected relief of all pain, and 50% of patients with KL grade 1 expected relief of all pain ( $p < 0.001$ ).

Increasing age was seen with increasing KL grades ( $p < 0.001$ ); however, age was not associated with expectation of pain or level of pain relief ( $p > 0.05$ ). Gender was associated with expectation of pain relief and level of pain relief. 80% of women considered pain relief a very important expectation while only 69% of men considered it very important ( $p < 0.001$ ). 92% of women expected most or all pain to be relieved while 88% of men expected most or all pain to be relieved ( $p = 0.006$ ). All patient-derived scores were associated with KL grade and expectations of pain relief. Patients with moderate to severe osteoarthritis (KL grade 3 or 4) had significantly lower SF 12 physical component (PCS) and mental component scores (MCS) and higher WOMAC scores (higher equals more disability) ( $p < 0.001$ ) compared to patients with grade 1 or 2 KL. Patients who considered pain relief very important had lower SF12 PCS scores and higher WOMAC scores ( $p < 0.001$ ). Patients who expected all pain to be relieved had lower SF12 PCS and SF12 MCS, and higher WOMAC scores ( $p < 0.001$ ).

**Conclusions:** This study demonstrated that most people with some level of knee osteoarthritis consider pain relief an important expectation of treatment. Expectations of treatment involving pain are associated with gender, but not age, and are also related to the level of disability and impact on general health. Patients with moderate to severe osteoarthritis don't expect relief of all pain; however, they are

suffering from increased disability and lower physical and mental health status.

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#### CHANGES IN KNEE PAIN, PERCEIVED NEED FOR SURGERY, PHYSICAL FUNCTION AND QUALITY OF LIFE AFTER DIETARY WEIGHT LOSS IN OBESE WOMEN DIAGNOSED WITH KNEE OSTEOARTHRITIS

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**Purpose:** The objective of this study was two-fold: 1) to investigate whether weight loss is associated with a reduction in perceived need for Total Knee Replacement (TKR) surgery due to decrease in knee pain and improvement in function, 2) to identify what percentage of weight loss is associated with reduction in knee pain to a point where the need for surgery could be prolonged or alleviated. 34 subjects were recruited into the study.

**Methods:** Women between 40 and 65 years old with morbid obesity (BMI  $\geq$  35 kg/m<sup>2</sup>) and osteoarthritis of the knee were pre-selected. Participants completed the Western Ontario and McMasters (WOMAC) Universities index, The Short Form Health Survey (SF-36); 6-Minute Walk Test and Timed Up and Go at baseline and participants were enrolled into a weight loss program, for a 6 month period.

**Results:** Repeated measures ANOVA revealed that at 6 weeks of diet the mean body weight reduction of 9.5%, was followed by a significant reduction ( $p=.015$ ) in WOMAC scores and ( $p=.038$ ) SF-36 sub score of physical function. At 3 months of diet a significant reduction of 16.5% in body weight corresponded to a significant decrease of 37% in knee pain and 56% in perceived need for surgery.

**Conclusion:** These results suggest that an initial loss of 16.5% of body weight for obese individuals was significant enough to reduce pain and postpone patient's intent to have surgery in 56%. Even though a weight loss of 16.5% might influence a patient's choice to undergo TKR surgery, these findings might not be extended to the general morbidly obese population. However, based on our results we expect that a weight loss of 16.5% might provide a major decrease in knee pain and increase in function.

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#### GLUTAMATE IS ELEVATED IN PATHOLOGIC POSTERIOR TIBIAL TENDONS OF PATIENTS WITH POSTERIOR TIBIAL TENDON DYSFUNCTION

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**Purpose:** Pain is the predominant symptom for many patients with degenerative orthopedic diseases. Oftentimes the pathophysiology of pain in orthopedic disease is not well understood, such as in tendons, which are relatively avascular and aneural. The posterior tibial tendon (PTT) is critical for inversion of the foot and arch stability. When the PTT elongates, through repetitive microtears, it results in a syndrome of significant pain and disability called posterior tibial tendon dysfunction (PTTD). Glutamate is a well-known and potent pain generating excitatory neurotransmitter shown to play a role in Achilles and patellar tendinopathy and as such we expect it to play a role in PTTD. The purpose of this study was to quantify the concentration of glutamate in cultured media from PTT tendon explants of PTTD patients and healthy controls.

**Methods:** Samples of PTT and flexor digitorum longus (FDL) were collected from twenty-one patients undergoing FDL tendon transfer surgery for stage II PTTD that failed conservative management. The excised portion of the PTT was dissected from the area of maximum disease as determined by gross morphology. Healthy FDL tendon was obtained from trimmings that otherwise would have been discarded. Diseased and healthy tendon samples were trimmed to make them approximately the same size per patient. The samples were washed three times in Dulbecco's modified essential media (DMEM) and then weighed. Samples were then incubated in 3 mL of DMEM with 5 mg penicillin and streptomycin and 12.5 mg HEPES at 37°C with 5% CO<sub>2</sub> for 48 hours to allow for substance diffusion. After 48 hours, the spent media was frozen at -80°C until use. Sample media was spun down through a 10 kDa spin filter (Pall, OD010C34) and glutamate was detected using a colorimetric assay kit (Sigma Aldrich, MAK004). All measurements were normalized by mass and analyzed using a matched-pair t-test.

**Results:** The samples were obtained from 15 females and 6 males with a mean age of 64 years (range, 53 to 76 years). Glutamate levels from the diseased PTT tendons were significantly elevated compared to the healthy FDL tendons ( $p = 0.03$ , Table 1).

**Conclusions:** The etiology of debilitating pain in PTTD is not well understood. We found that glutamate levels are significantly elevated in the diseased portion of the PTT in PTTD when compared to healthy FDL tendon from the same individual. This marked increase in glutamate concentration may contribute to pain through binding with its ionotropic ligand, NMDA, within the tendon or the surrounding tissues. Characterizing the local production of pain generating excitatory neurotransmitters potentially improves our understanding of the pathophysiology of pain and may yield better non-surgical treatment options.

**Table 1**

Glutamate levels in diseased PTT and healthy FDL tendons

Group (n=21 each)	Glutamate Concentration (nM/g)	95% Confidence Interval
Diseased PTT	12.3 +/- 14.3	5.8-18.9
Healthy FDL Tendon	4.9 +/- 3.7	3.19-6.5

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#### CHANGES IN ADL AND LOWER LIMB FUNCTION AFTER TOTAL KNEE ARTHROPLASTY

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**Purpose:** Total knee arthroplasty (TKA) has been established as an effective treatment method that decreases knee pain in osteoarthritis (knee OA). However, it has not been studied sufficiently how much lower limb function and ADL are improved by TKA. The aim of the present study is to establish whether the disorders in ADL are improved similarly to pain by using self-administered rating scale and pain VAS. Lower limb function was assessed by using timed Up & Go test (TUG) and timed open-eyes one-foot standing (TOFS).

**Methods:** We examined 56 knees-OA patients (men5 women51)(the mean age 74.6 years), 71 knees in which we had performed TKA between July 2011 and September 2012 in our hospital. Patient were assessed preoperatively and postoperatively at 6M using Japanese Knee Osteoarthritis (JKOM), a disease-specific instrument for measuring clinical outcome in patients treated for knee OA. The lower limb function was evaluated using TUG and TOFS. Pain was evaluated using JKOM subscale ;II Pain and stiffness in Knees, score(0-32) and Visual Analog Scale (VAS)(0-100mm). Disorders in ADL was assessed by using JKOM subscale ; III Disorders in usual life, score(0-40).

**Results:** Regarding pain, VAS and JKOMII were significantly improved by TKA from 70.9(20.0)(SD) to 10.7(13.9), and 18.8(6.4) to 5.4(3.8). Concerning disorders in ADL, JKOMIII was also significantly improved from 19.8(8.1) to 9.0(5.6). As to lower limb function, TUG and TOFS were also significantly improved from 17.4(5.7) to 15.0(5.1) and 13.6(16.6) to 21.4(18.9) sec. Postoperative TUG was significantly correlated with postoperative ADL(JKOMIII) in multiple regression analysis(linear type) ( $\beta=0.574$  95%CI:0.255-0.866  $p=0.01$ ).

**Conclusions:** Disorders in ADL were improved as well as pain by TKA. TUG is thought to be useful tools which evaluate lower limb function in TKA.

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#### OA PAIN SHOWS ANTI-PERSISTENT TIME SERIES

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**Purpose:** The pain associated with osteoarthritis (OA) is the most common symptom for OA patients, serving as a predictor of reduced levels of everyday physical activity. Characterizing the pain of OA is critical to understand mechanisms underlying the disease and to develop approaches to intervene. However, the research on the temporal dynamics of OA pain intensity, especially over longer periods of time, is still rare. In this study, we collected pain ratings from individuals with knee OA 3 times per day over 3 months to explore the temporal properties of the pain.