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Original Investigation

A cross-sectional study of perceived injustice and disability in hip osteoarthritis

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Abstract

Objective: To determine the correlation among severity of hip osteoarthritis, disability, and Perceived injustice.

Material and Methods: A cohort of 46 participants with unilateral hip osteoarthritis underwent hip range of motion measurements and completed the Injustice Experience Questionnaire (IEQ), the Hip Disability and Osteoarthritis Outcome Score (HOOS), and a Croft radiological grading of osteoarthritis severity.

Results: The mean age of the cohort was 62.7±10.4 years, and the cohort included 27 females. The mean duration of symptoms was 46.9±20.6 months. The means of each of the five subscales of the HOOS were as follows: Pain, 62.3±9.4; Other Symptoms, 56.7±9.6; Function in Activities of Daily Living (ADL), 58.2±6.7; Function in Sport and Recreation (Sport/Rec), 58.1±6.7; and Hip-Related Quality of Life (QOL) 59.9±7.5. The combined mean hip range of motion (abduction, adduction, flexion, extension, external rotation, internal rotation) was 215.9±10.9 degrees. The mean IEQ score (Perceived injustice) was 12.0±1.7. Of the available factors, only QOL, hip range of motion, and the Croft radiological osteoarthritis grade predicted Perceived injustice scores, with an R-squared of 0.81 in multiple regression analysis.

Conclusion: In this cohort of patients with unilateral osteoarthritis, more severe disease (as measured by restricted range of motion and radiological severity) was highly correlated with higher levels of Perceived injustice. Perceived injustice may thus reflect an appropriate response to the severity of the disease and is thus more likely a result of the disease process and subsequent disability rather than a cause of disability.

Keywords: Hip osteoarthritis, perceived injustice, pain, arthritis

Introduction

The relationship among chronic pain, disability, and response to therapeutic interventions has recently been investigated by examining Perceived injustice in chronic pain sufferers (1-4). Perceived injustice is operationally defined as a multidimensional construct that comprises elements that assess the severity of loss, irreparability of loss, blame, and sense of unfairness (1-4). This definition has led to the development of the Injustice Experience Questionnaire (IEQ) (1). The IEQ asks participants to rate the frequency with which they experienced each of 12 pain-related thoughts on a 5-point scale, ranging from 0 (never) to 4 (all the time). Examples of items include "Most people don't understand how severe my condition is," "My life will never be the same," "I am suffering because of someone else's negligence," and "It all seems so unfair." The maximum score (maximal Perceived injustice) is 48, and the minimum is zero. The scale can be further divided and scored based on two factors: Blame/Unfairness and Severity/Irreparability of Loss.

The degree of Perceived injustice in chronic pain suffers has been shown (mainly cohorts of patients who have been involved in motor vehicle collisions and those with fibromyalgia) to be associated with higher pain severity, depression, catastrophizing, fear of movement, self-reported disability, protective pain behaviors, less progress in rehabilitation, and lower probability of return to work (2-4). The higher the level of Perceived injustice, the lower the likelihood of subsequent response to rehabilitation. Scott et al. (5) studied 103 whiplash injured participants some 2-6 months after injury, none of whom had recovered by the time of the study initiation. Based on measuring Perceived injustice via the IEQ at the outset of the study and then re-examining participants after the completion of a 7-week program and 1 year later, Scott et al. (5) showed that IEQ scores significantly discriminated individuals who returned and did not return to work at 1 year. IEQ scores at the end of treatment also discriminated between individuals with high and low pain severity ratings and narcotic use status at the 1-year follow-up. Perceived injustice is thus becoming a relevant topic in understanding pain and disability outcomes in a variety of disorders.

A limitation of the above studies, however, has been two-fold. First, most studies have had a cross-sectional design. It is thus difficult to ascertain whether high levels of Perceived injustice are, understandably, the re-

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sult of chronic pain and disability or whether, in fact, high levels of Perceived injustice increase pain and disability. Second, studies assessing Perceived injustice have been largely limited to syndromes without objective markers (e.g., whiplash injury and fibromyalgia). This further limits our understanding as to what degree any disability, for example, is subsequent to the activity of the disorder (i.e., the pain, fatigue, depression) or is instead mediated by perceptions of injustice, as Perceived injustice could itself contribute to symptoms (1).

To address these two issues, there have been limited efforts. First, a prospective evaluation of Perceived injustice was performed to evaluate the time point at which higher levels of Perceived injustice develop during the course of recovery in whiplash patients (6). Acute whiplash patients completed the IEQ at presentation and also 3 months and 6 months after injury. At each of these two follow-up points, participants were examined for recovery. Near the time of injury, the initial IEQ score was low. The mean score at the 3-month follow-up had increased in the cohort, but there was no difference between those who had recovered at 3 months from their whiplash injury and those who had not. At 6 months after injury, however, the mean IEQ score of the cohort who still reported a lack of recovery had suddenly increased. It was concluded that the development of high levels of Perceived injustice at 6 months after injury appeared to follow the development of chronic pain and a lack of recovery at 3 months. This study suggested that chronic pain occurred first, followed by Perceived injustice.

In terms of assessing conditions with objective disease, another study (7) compared levels of Perceived injustice via the IEQ in patients with fibromyalgia or rheumatoid arthritis. Both cohorts completed the IEQ. In unadjusted analysis, the fibromyalgia group had higher IEQ scores. When the rheumatoid arthritis and fibromyalgia group scores for the IEQ were adjusted for pain levels, however, there was no statistically significant difference between groups. Thus, this study suggested that rheumatoid arthritis patients, who clearly can have objective disease, can also have high levels of Perceived injustice when they have more pain. However, the authors did not correlate Perceived injustice scores with any objective disease measure in this study.

To extend this analysis further, an objective, less controversial disorder is needed, with objective disease measures. If one finds that there is a correlation between objective pathology or disease severity and Perceived injustice, then, it follows that the objective disease severity is the cause of Perceived injustice and not vice versa (i.e., one does not expect high levels of Perceived injustice to create more severe disease; for example, more severe radiological changes).

In the current study, the author examined the levels of Perceived injustice in subjects with hip osteoarthritis, as this is a disease with objective radiological and clinical markers. The purpose of the study was to determine the predictors of Perceived injustice in hip osteoarthritis sufferers.

Material and Methods

Participants

Participants were recruited from three primary care clinics in Edmonton, Alberta, Canada, serving a catchment area of 1.5 million people. General practitioners at the clinics routinely, directly referred patients with known or suspected hip osteoarthritis to the author, who was acting as the specialist consultant within these clinics. The specialist was an internist with an interest in rheumatology and chronic pain. It was the practice during the time of this consultant's presence at the clinic to refer most, if not all, hip osteoarthritis patients to the consultant as well as undiagnosed patients with inguinal thigh or knee pain. To create a representative cohort of the referring clinics, prospective participants were evaluated consecutively according to inclusion and exclusion criteria.

Inclusion and exclusion criteria

Participants were included if they were 18 years or older and if they had a chief presentation of inguinal buttock, thigh, or knee pain with a current or subsequent diagnosis of hip osteoarthritis. A diagnosis of hip osteoarthritis was based on the history of pain in the above regions, reproduced with hip movements, associated with radiological findings consistent with osteoarthritis of the hip joint, and not explained by other diagnoses.

Participants were excluded if they were unable to read English at the grade 8 level. They were also excluded if they had been found to have bilateral hip osteoarthritis, because both range of motion and radiological findings are variables of interest, and one would need to average the range of motions and radiological findings of both hips to include this type of patient. Patients were excluded if they had any lower limb surgery (including joint replacement), rheumatoid arthritis, spondyloarthropathy, current malignancy, Paget's disease, or metabolic bone disease. Patients were also excluded if they were determined to have knee pain for more than 1 day per week when the knee pain was deemed not to be simply referred pain from the hip joint but a knee disorder. Because back pain is commonly experienced in lower limb disorders, patients were only excluded if they had significant low back pain (more significant than their hip complaints) or lumbar radiculopathy. Finally, patients were excluded if they had a significant, painful disorder in a region other than the hip, including those with widespread pain, such as fibromyalgia. These criteria were designed to create a relatively homogeneous sample of participants with unilateral hip osteoarthritis.

Data collection

As a routine part of the assessments (initial and follow-up) of patients, the author collected data on age, sex, duration of symptoms, current and past treatment, hip joint range of motion, and radiological findings.

The author had, at the time of the study, been routinely testing different disability questionnaires for osteoarthritis and had been testing the usefulness of the IEQ in a wide variety of pain patients. Thus, this information was also available as of the initial and follow-up consultations as part of the routine measures provided to all patients (i.e., as part of usual assessment).

Measurements

Perceived injustice

The IEQ was used, as described above and by Sullivan et al. (2), to measure injury-related perceptions of injustice. The questionnaire instructions were modified to include the phrase "injury/illness," as the original questionnaire referred only to injury, which would not necessarily be appropriate in this sample.

Hip range of motion

Passive range of motion of the affected hip was measured using a standard approach described by others, with high intra-rater reliability (8). The author used 1°-increment plastic goniometer with a moveable arm. Hip flexion, adduction, and abduction were measured in the supine position, with the opposite thigh fixed in a neutral position. Internal and external rotation were measured in the prone position, with the hip extended and the knee in 90° of flexion. Finally, hip extension was measured using the modified Thomas test. Here, the participant was in the supine position with legs hanging off the examining table, and the unaffected hip was flexed to at least 90 degrees

to eliminate lumbar lordosis. Then, the affected hip was allowed to rest passively. The examiner applied gentle pressure downward on the hanging knee to observe the final measurement angle, which was measured as a value at or below the horizontal. The stationary arm of the goniometer was aligned with the lateral midline of the pelvis. The moving arm was aligned with the midline of the femur using the lateral condyle as a reference point.

Radiological osteoarthritis grading

Radiological grading was performed by the author, who has had previous training on use of the grading system by Croft et al. (1990) (9). This system grades OA into five categories: grade 1, osteophytosis only; grade 2, joint space narrowing only; grade 3, two of osteophytosis, joint space narrowing, subchondral sclerosis, and cyst formation; grade 4, three of the same features as above; and grade 5, as in grade 4 but with deformity of the femoral head.

Hip disability and osteoarthritis outcome score (HOOS)

The HOOS was developed as an instrument to assess the patients' opinion about their hip and associated problems, and it is intended to be used in an adult population with hip disability with or without osteoarthritis (10, 11). The HOOS has been used in patients aged 42-89 years, has validity, and a high test-retest reproducibility (ICC>0.78), and is responsive to treatment (12, 13). The HOOS consists of five subscales: Pain, Other Symptoms, Function in Activities of Daily Living (ADL), Function in Sport and Recreation (Sport/Rec) and Hip-Related Quality of life (QOL). The previous week is the period considered when answering the questions. Standardized answer options are given (5 Likert boxes), and each question is assigned a score from 0 to 4. A normalized score (100 indicating no symptoms and 0 indicating extreme symptoms) is calculated for each subscale. The five scales cannot be combined for a total score, as the validity of this has not yet been tested. The English version of the HOOS (version LK 2.0) was used.

Interventions

To further describe the cohort, past, current, and imminently planned treatments were noted by the author, and the proportions of subjects who had received or were planned to receive various treatments were calculated. The various treatments included physiotherapy, custom-made foot orthotics, intra-articular corticosteroid injections, acupuncture, acetaminophen without narcotics, narcotics, non-steroidal anti-inflammatory drugs, muscle relaxants, and gaba analogs (e.g., gabapentin). The number of subjects waiting to be evaluated by an orthopedic surgeon was also recorded.

Statistical analysis

Initially, all data records were reviewed to ascertain if any data issues, such as missing data, outliers, or out of range values, existed within the dataset. Descriptive statistics were used to summarize the age, sex distribution, duration of symptoms, and proportion of subjects using specific interventions. In addition the mean scores and standard deviations were calculated for the five subscales of the HOOS, the IEQ (including two subscales), and the hip range of motion. The proportion of participants who had each of the Croft radiological grades was also calculated. The angles of the hip range of motion measurements were combined into a total hip range of motion angle to simplify analyses. Before doing so, the Spearman rank correlation detected strong collinearity among the six range of motion measures: ($r=0.77$; $p<0.0001$). This verified the generation of a single summary range of motion score that was representative of hip mobility.

A stepwise multiple regression analysis was performed to evaluate the variables that contribute to Perceived injustice, which is the dependent variable. Our final models were built in a blocked manner by initially entering the diagnostic category into the model and then entering other variables simultaneously using a stepwise strategy (p-to-enter≤0.05, p-to-remove≥0.10). The following independent variables were initially included in the stepwise regression model: age, gender, duration of symptoms, five subscales of the HOOS, total hip range of motion, and radiological grading. The variables that were identified by the stepwise procedure were entered into the multiple regression analysis. An alpha level of 0.05 was used to judge statistical significance. All analyses were conducted using IBM SPSS Statistics for Macintosh, version 20 (Chicago, Illinois, USA).

Sample size calculation

Due to the challenges in creating the cohort (the author had a limited time span as the consultant at these clinics), it was known that the sample size would be relatively small, and that only a fairly high anticipated effect size could be considered. The author thus calculated the sample size required for multiple linear regression with an anticipated effect size of 0.50, a power level of 0.80, a probability level of 0.05 and the assumption that there could be a maximum of 11 predictors. Using these values, the required sample size was 45, and the author aimed to collect at least this sample size.

Results

Participant selection and data cleaning

Of a total of 84 potential participants, 36 were excluded (12 due to bilateral hip osteoarthritis, 14 due to coincidental and symptomatic knee osteoarthritis, 5 due to spinal pain with osteoporotic fractures, 2 due to severe low back pain as the chief complaint, 2 due to knee replacements, 1 due to lumbar radiculopathy). This left 48 participants who underwent x-ray grading of their hip osteoarthritis, range of motion measurements, the HOOS, and Perceived injustice assessments. Data were complete for all subjects, except two, where multiple aspects of the HOOS were missing. This left 46 subjects with complete data.

Descriptive statistics

Table 1 reveals the mean age, sex, duration of symptoms, HOOS subscale scores, hip range of motion, and Perceived injustice scores. In addition, the table shows the proportion of participants having each of the five radiological grades of osteoarthritis, the proportion of subjects having used or currently using various treatments, and the proportion of participants referred for evaluation by an orthopedic surgeon.

Multiple regression analysis

The stepwise regression analysis revealed 3 of 10 variables to be significant, namely the HOOS subscale QOL, the hip range of motion, and the Croft radiological grading score. These three factors were entered into the multiple regression model, with the resulting beta coefficients shown in Table 2. The R-squared value for the model was 0.81, confirming the importance of these variables in predicting Perceived injustice.

Discussion

This study showed that higher levels of Perceived injustice were associated with more severe restrictions in hip range of motion, more advanced radiological scoring of osteoarthritis, and a lower QOL, as measured by the HOOS. The fact that Perceived injustice was strongly correlated to objective severity of disease (hip range of motion and radiological severity) suggested that it was a response to this disease severity and the impact it had on, for example, QOL.

This study confirmed that a feeling of injustice may be perceived with a variety of illnesses, including whiplash injury, fibromyalgia, rheumatoid arthritis, and osteoarthritis. In the study of fibromyalgia and whiplash injury, the association between high levels of Perceived injustice and pain or disability has been generally examined in a cross-sectional design (1-4, 6). Thus, it is not clear whether the high levels

Table 1. Participant characteristics, with mean scores for five subscales of the HOOS, Injustice Experience Questionnaire (IEQ) mean scores (including two subscales), mean total hip range of motion, and croft radiological score of osteoarthritis severity.

Measure	
Age (mean±sd, range) in years	62.7±10.4, 48-87
Sex (% of female)	59
Duration of symptoms (mean±sd, range) in months	46.9±20.6, 12-78
Hip disability and osteoarthritis outcome score	
Subscale pain	62.3±9.4, 35-75
Subscale other symptoms	56.7±9.6, 32-70
Subscale function in Activities of Daily Living (ADL)	58.2±6.7, 43-73
Subscale function in Sport and Recreation (Sport/Rec)	58.1±6.7, 40-71
Subscale hip-related Quality of life (QOL)	59.9±7.5, 42-76
Croft radiological score (proportion for each score)	
1	0.35
2	0.30
3	0.24
4	0.11
5	0
Total hip range of motion (mean±sd, range) in degrees	215.9±10.9, 197-240
Proportion being assessed by orthopedic surgery	0.43
Proportion who have received or are receiving specific treatments	
Acetaminophen	0.91
NSAID	0.28
Narcotics	0.80
Muscle relaxants	0.41
GABA agonists	0.15
Intra-articular corticosteroid injections	0.87
Physiotherapy	0.96
Acupuncture	0.20
Foot orthotics	0.59
Injustice Experience Questionnaire (IEQ) Total (mean±sd, range)	12.0±1.7, 9-16
IEQ blame/unfairness subscale (mean±sd, range)	4.3±0.8, 3-6
IEQ severity/ irreparability subscale (mean±sd, range)	7.7±1.8, 5-12

n:46; SD: standard deviation; HOOS: hip disability and osteoarthritis outcome score; NSAID: non-steroidal anti-inflammatory drug; GABA: gamma-aminobutyric acid

Table 2. Factors for perceived injustice from the multiple regression analysis. Hip Disability and Osteoarthritis Outcome Score (HOOS) subscale for QOL

Factor	Beta coefficient	Lower CI	Upper CI
QOL	-0.126	-0.172	-0.081
Hip range of motion	-0.048	-0.082	-0.014
Croft radiological grading score	0.364	-0.007	0.734

QOL: quality of life; CI: confidence interval

of Perceived injustice are a result of pain and disability or the cause. Examining rheumatoid arthritis patients and comparing their levels of Perceived injustice to those of fibromyalgia patients have revealed that the higher the pain levels, the higher the Perceived injustice in both conditions (6). Again, the causal nature of the association is not discernible in a cross-sectional design. A prospective study of whiplash injury has confirmed, however, that chronic pain may develop first, followed by high levels of Perceived injustice (7).

The current study of osteoarthritis patients confirmed that there was a strong association between objective measures of disease severity, and that Perceived injustice helped determine the causal association. It seems impossible that higher levels of Perceived injustice could cause greater restriction in hip range of motion or more advanced radiological changes. Instead, it seems far more reasonable to assume that the more severe the disease, the greater the perceptions of injustice such that patients will endorse statements like "Most people don't understand how severe my condition is"" and "My life will never be the same." These are reasonable responses to more severe disease. Thus, it is not yet clear how much Per-

ceived injustice contributes to pain and disability or is the response to pain and disability. Both may be possible, as suggested in the prospective follow-up of whiplash injured subjects (7), where higher levels of Perceived injustice developed after the development of chronic pain at 3 months but then predicted failure of recovery thereafter.

There are limitations to the study. The study was sufficiently powered for larger effect sizes but not for effect sizes below 0.50. It is possible, with larger sample sizes, that the smaller effect sizes of factors such as pain could also have been found to be independent predictors of Perceived injustice. However, because pain is subjective and could be affected by higher levels of Perceived injustice, knowing it was an independent predictor would not have helped to sort out the direction of that association. Furthermore, it should be noted that, in a study of 149 patients, none of the factors of age, sex, or body mass index predicted disability (14). A second limitation is that the sample may not be generalizable to other patient populations, as only unilateral osteoarthritis was considered. Nevertheless, the responses in terms of reported disability and the measured hip range of motion are in keeping with other surveys (8, 10, 11). In addition, as in a previous study (8), there was a strong association between restrictions in hip range of motion and measures of disability. However, because we excluded subjects with bilateral osteoarthritis, the findings can only be limited to this well-defined group. Further, specific treatment effects on Perceived injustice were not taken into consideration.

In summary, Perceived injustice continues to be an important theme in chronic pain and disability in a wide variety of conditions. Disorders such as fibromyalgia, osteoarthritis, rheumatoid arthritis, and chronic pain from whiplash injury can both be associated perceptions of injustice. These perceptions can arise from the burden of the illness, but there is also evidence that these perceptions may then interfere with rehabilitation efforts. How these perceptions do so and how this can be prevented are not yet clear. Nevertheless, Perceived injustice remains a fruitful area of investigation. Future studies should examine a wide variety of conditions, especially those with objective measures that correlate with disability, to determine how perceptions of injustice may result from disease burden and also affect treatment and rehabilitation of that disease.

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