Pain Deterioration Within 1 Year Predicts Future Decline of Walking Ability: A 7-Year Prospective Observational Study of Elderly Female Patients With Knee Osteoarthritis Living in a Rural District

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Abstract

Introduction: Knee osteoarthritis (KOA) is commonly a main cause of locomotive syndrome. Consequently, appropriate timing of intervention is clinically important. Materials and Method: Fifty female patients of a primary care clinic in a rural district fulfilled the criteria for KOA and were recruited and underwent knee medical checkups. They initially underwent physical examination bilaterally of knees by an orthopedic surgeon, radiological evaluation, and they answered the outcome of Japanese Knee Osteoarthritis Measurement (JKOM). They were asked to answer JKOM 1 and 7 years after the initial checkup. Fourteen patients were lost to follow-up due to death or moving to a nursing home. Thirty-six patients were finally included and divided into 2 age-matched groups according to walking ability at the 7-year follow-up: group A, walking ability did not decline (n = 24), and group B, walking ability did decline (n = 12). The walking ability was measured as per ordinal classification as: 5 (walking without any aid), 4 (walking with a crutch), 3 (walking using walker), 2 (walking only possible in parallel bars), and 1 (wheelchair). We completed between-group comparisons of each of the 3 subsections of the JKOM (pain, limitation in mobility related to daily activity, and restriction of participation in social life and health perception), during each period. Results: There were significant differences in JKOM pain score (12.9 vs 18.3, P = .0058) and total score (41.3 vs 55.8, P = .0093) between the groups at 1-year follow-up, even though base scores did not differ. Discussion: Clinicians should pay attention to changes in perceived knee pain and should not continue prolonged conservative therapy in patients exhibiting rapid deterioration. Conclusion: Female patients with KOA whose pain deteriorated within 1 year may require early intervention to prevent future decline in walking ability.

Keywords

Kellgren-Lawrence, knee osteoarthritis, Japanese knee osteoarthritis measurement, activities of daily living, locomotive syndrome

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Introduction

Musculoskeletal disorders such as osteoporosis (OP) and osteoarthritis (OA) deteriorate mobility of the aged population. As the population in Japan ages, fractures due to OP or OA are top ranked as reasons related to disability.¹ In addition, sarcopenia is associated with increased risk of falling, and elderly individuals will frequently exhibit fall-induced fractures.² The Japanese Orthopedic Association described “locomotive syndrome,” (LS) as decreased walking ability due to musculoskeletal disorders and/or sarcopenia and suggested the
Knee osteoarthritis (KOA) is the most common musculoskeletal disease, affecting approximately 4% of the world’s population, and it is estimated that there are more than 25,000,000 patients with radiographic KOA who are older than 40 years of age in Japan. Care and prevention of KOA helps prevent LS. Patients with radiographic KOA who are older than 40 years of age. The clinic was usually operated by a family physician in that clinic during the study periods. The population,4 and it is estimated that there are more than 25,000,000 patients with KOA. Inclusion criteria were patients >65 years old at the time of initial knee medical checkup; diagnosis of KOA by radiological evaluation; and patients who could walk unaided, or with 1 hand cane. Exclusion criteria were patients who had already undergone KR at the time of initial knee medical checkup; patients who complained of knee pain without radiological evidence of KOA; and patients who could not walk without aid, except for 1 hand cane.

Materials and Methods

Knee medical checkups were performed for patients of a primary care clinic in a rural district in 2008. The population of the district was 250 and approximately 72% of the population was older than 65 years of age. The clinic was usually operated by a family physician. One hundred patients regularly visited this clinic fulfilling the criteria of KOA and were recruited for this study. Fifty female patients who regularly visited this clinic fulfilled the criteria of KOA and were recruited for this study. They started receiving medication such as oral analgesics and/or intra-articular hyaluronic injections after diagnosis. They were asked to complete the JKOM 1 year from the initial checkup. Fourteen out of 50 patients were lost to follow-up due to death (7 patients), or moving to nursing home (1 patient), and the rest for reasons unknown (6 patients). So finally, 36 patients were included in the study. We had confirmed that none of 36 patients developed any additional disease contacting with family physician in that clinic during the study periods. The patients were divided into 2 groups according to walking ability at the time of the 7-year follow-up: group A, walking ability did not decline from baseline (n = 24, averaged age: 76.8 ± 6.8 years), and group B, walking ability declined from baseline (n = 12, averaged age: 78.6 ± 6.6 years; Figure 1). Walking ability was stratified according to a 5-point scale: 5 points, walking without any aid; 4 points, walking with cane; 3 points, walking in parallel bars; 2 points, walking with a walker; and 1 point, wheelchair. The groups did not differ concerning age, weight, and body mass index. On the other hand, there was significant difference between the groups concerning height at the time of 7-year follow-up (Table 1).

Statistical Analysis

Data are presented as the mean and standard deviation. Student t test was used to compare the numerical data. Fisher exact test was used to compare the distribution of radiological grade of KOA. All statistical analyses were performed using EZR software (http://www.jichi.ac.jp/saitama-sct/SaitamaHP.files/statmed.html). A priori sample size calculation for primary outcome was performed and the significance level was set at P < 0.05. The power analysis for an α error of 0.05, and an effect size of 0.8 was calculated (using G_Power 3.1, Franz Paul, Kiel, Germany). A power analysis calculated a β error of 0.4 (i.e., the power was 0.6) with 24 patients in group A and 12.
patients in group B. Walking ability at 1- and 7-year follow-up and points for each of the 3 subsections of the JKOM at 1-year follow-up were compared between the groups.

**Results**

**Radiological Evaluation of the Knee**

There were no significant differences between the groups with regard to KL grade ($P = .35$; Table 2).

**Table 1. Patient Demographics Between the Groups.**

|                | Group A  | Group B  | $P$ Value |
|----------------|----------|----------|-----------|
| Age            | 76.8 (6.9) | 78.6 (6.6) | 0.42      |
| Height         | 148.6 (6.0) | 144.0 (6.2) | 0.046     |
| Weight         | 52.0 (8.6)  | 53.5 (13.7) | 0.75      |
| BMI            | 23.5 (3.1)  | 25.4 (7.2)  | 0.27      |

Abbreviation: BMI, body mass index.

*a*Data are expressed as average (standard deviation).

**Table 2. Differences Between the Groups With Regard to Radiological Evaluation of KOA.**

| KL Grade | Group A | Group B | $P$ Value |
|----------|---------|---------|-----------|
| 2        | 20      | 8       | 0.35      |
| 3        | 4       | 3       |           |
| 4        | 0       | 1       |           |

Abbreviations: KL, Kellgren-Lawrence; KOA, knee osteoarthritis.

**Table 3. Differences Between the Groups Concerning Baseline JKOM Scores.**

|                | Group A  | Group B  | $P$ Value |
|----------------|----------|----------|-----------|
| Pain           | 11.9 (3.3) | 12.4 (4.2) | 0.73      |
| Physical function | 14.6 (3.6) | 19.2 (8.3) | 0.051     |
| Social function | 11.3 (1.9)  | 13.9 (5.8)  | 0.092     |
| JKOM           | 37.8 (7.7)  | 45.5 (15.9) | 0.092     |

Abbreviation: JKOM, Japanese knee osteoarthritis measurement.

*a*Data are expressed as average (standard deviation).

**Baseline JKOM Scores**

There were no significant differences between the groups concerning baseline JKOM pain scores ($11.9 \pm 3.3$ vs $12.4 \pm 4.2$, $P = .73$), JKOM physical function scores ($14.6 \pm 3.6$ vs $19.2 \pm 8.3$, $P = .051$), JKOM social function scores ($11.3 \pm 1.9$ vs $13.9 \pm 5.8$, $P = .092$), and JKOM total scores ($37.8 \pm 7.7$ vs $45.5 \pm 15.9$, $P = .092$; Table 3).

**Japanese Knee Osteoarthritis Measurement Scores at the Time of 1-Year Follow-Up**

There were significant differences between the groups with regard to JKOM pain scores ($12.9 \pm 4.3$ vs $18.3 \pm 6.7$, $P = .0058$), JKOM physical function scores ($15.5 \pm 5.0$ vs $21.6 \pm 8.1$, $P = .0082$), and JKOM total scores ($41.3 \pm 12.7$ vs $55.8 \pm 18.4$, $P = .0093$) at the time of 1-year follow-up. On the other hand, there was no significant difference between the
Table 4. Differences Between the Groups Concerning JKOM Scores at the Time of 1-Year Follow-Up.a

|          | Group A     | Group B     | P Value |
|----------|-------------|-------------|---------|
| Pain     | 12.9 (4.3)  | 12.9 (4.3)  | .13     |
| Physical | 15.5 (5.0)  | 14.6 (3.6)  | .33     |
| Social   | 12.4 (4.2)  | 11.3 (1.9)  | .25     |
| JKOM     | 45.5 (15.9) | 45.5 (15.9) | .053    |

Abbreviation: JKOM, Japanese knee osteoarthritis measurement.
*aData are expressed as average (standard deviation).

Table 5. Change of Each Score of JKOM During 1-Year Follow-Up.a

|          | Baseline | 1-Year F/U | P Value |
|----------|----------|------------|---------|
| Group A  | 23.8 (3.1)| 25.8 (3.1) | .19     |
| Group B  | 12.4 (4.2)| 13.3 (4.3) | .25     |
| Physical | 19.2 (6.3)| 21.6 (8.1) | .25     |
| Social   | 18.3 (1.9)| 21.6 (8.1) | .25     |
| JKOM     | 54.3 (15.9)| 58.9 (18.4)| .053    |

Abbreviation: F/U, follow-up; JKOM, Japanese knee osteoarthritis measurement.
aData are expressed as average (standard deviation).

Discussion

The main findings of this study were: (1) patients whose knee pain deteriorated within 1 year also reported whose physical function score of JKOM at the time of 1-year follow-up; (2) deterioration of pain score, compared with baseline, was observed in patients whose walking ability deteriorated by the time of 7-year follow-up; and (3) over 40% of the patients whose knee pain deteriorated by the 1-year follow-up were unable to walk by the 7-year follow-up.

There are currently only a few reports about the natural course of KOA. Thorstensson et al described that 90% of the patients with clinical KOA and 78% without clinical KOA developed tibiofemoral OA over a 12-year follow-up period.13 Felson et al noted that bone marrow edema was a risk factor for deterioration in patients with KOA.20 However, the above studies did not focus on clinical findings, but rather on radiological evaluations. There are no studies of how short-term changes in pain perception affect walking ability after longer follow-up. This might be because the majority of patients with painful KOA tend to have elective orthopedic surgery.21 In our study, over 40% of the patients whose knee pain worsened within 1-year follow-up were unable to walk by the 7-year follow-up, even though they had not developed any other additional diseases. The average pain score on the JKOM for group B was 18.3 and pain deterioration in group B was nearly 5 points. This change means many patients went from best to worst score on one question as the pain score in the JKOM varies from 8 (best) to 40 (worst). Wright et al found that the density of orthopedic surgeons and referring physicians was the dominant factor that affected care for patients with KOA.22 So general physicians in areas where the density of orthopedic and referring physicians is low should pay careful attention to their patients’ perceived pain levels and refer rapidly deteriorating patients to orthopedic surgeons for further management. However, in developing countries, it can be difficult for patients or general physicians to locate a specialist, particularly orthopedic surgeons.23 Consequently, orthopedic surgeons and referring physicians should also inform patients and general physicians of the importance of early interventions such as physiotherapy or elective surgery if needed for the patients with KOA who complain of worsening pain within the short term and the efficacy of early intervention to prevent decline of ADL is our future interest.

There were several limitations to this study. Firstly, only female patients fulfilled the inclusion criteria because there were few male patients. The prevalence of KOA is reported to be much higher in female than in male populations. As a result, our findings should not be directly interpreted for male patients. Secondly, the number of patients included was low. However, in this district, there were an estimated 180 individuals over 65 years of age, and over half of the aged population (100/180) underwent screening by the orthopedic surgeon. Thirdly, power of this study was low according to small numbers of patients; there was a certain possibility of false-negative results. Fourthly, radiological evaluation of KOA was only...
performed at the time of initial checkup. Fifthly, there was significant difference in patients’ heights at the time of the 7-year follow-up. Height loss in the aged population might be caused by progression of spinal OP, which may affect walking ability.24 On the other hand, however, the study by Paradowski et al describes that weight, not height, is more likely to affect knee function and pain.25 So, further studies are needed to determine whether change of posture due to height loss affects perceived knee pain in patients with KOA.

Beyond these limitations, this prospective observational study clarified the natural course of patients with KOA whose pain worsened within the short term. Early intervention to prevent decline of walking ability may be beneficial for those patients, so clinicians should pay attention to changes in perceived knee pain and should not continue prolonged conservative therapy in patients exhibiting rapid deterioration.

Conclusion

Patients with KOA whose pain deteriorated within 1 year may need early intervention to prevent future declines in walking ability.

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