Original Article

Does Radiologic Grading Predict Severity of Osteo-arthritis Knee

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Abstract

Objective: Evaluation of association between pain and functional limitation of osteo-arthritis knee with radiographic features.

Methods: Total of 123 knee OA patients diagnosed on the basis of American College of Rheumatology Classification (ACR) Criteria for knee OA, attended in Physical Medicine and Rehabilitation (PMR) OPD, JNIMS, were included. Pain and disability were measured using Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and radiological grading by Kellgren-Lawrence (KL) grading from x-ray of weight bearing antero-posterior and lateral views. Correlation between WOMAC score and KL grading analysed.

Results: Sex distribution M:F=9:32, mean age 59.48 (+ 9.8), mean disease duration 4.79 (+ 0.41) months. Correlations of WOMAC pain and KL grading and WOMAC disability and KL grading were insignificant ($p > 0.05$).

Conclusions: There is discordance between radiographic findings and clinical features of OA knee and we should not plan treatment on the basis of radiologic grading rather on the functional status and symptoms.

Key words: **Osteo-arthritis knee, pain, disability, WOMAC score, KL grading.**

Introduction :

Osteo-arthritis(OA) of knee is a major health problem affecting approximately 30% of people over the age of 65 years[1], and is the number one cause of disability among the elderly, and because of the increase in ageing population, the prevalence of OA is expected to increase too[2].

Recently it has become apparent that OA is a disease process that affects the entire joint structure, including cartilage, synovial membrane, subchondral bone, ligaments and peri-articular muscles. But the major feature of OA is considered to be articular cartilage loss, which, together with meniscal pathology contributes to joint space narrowing (JSN) on knee radiographs[3].

Occurrence of OA in 75 years of age is >80%, weight bearing joints are affected more often (but not hip joint), females are more prone to develop OA, and persons with greater BMI has increase risk of OA[4-6].

Almost everyone has structural evidence of OA on radiographs or MR imaging in at least one joint by 70 years of age[5]. Most women in their sixties have evidence of OA affecting one or more hand joints. Nevertheless, many persons with structural OA, even those whose joints have evidence of substantial radiographic disease, do not have any joint symptoms[7].

The diagnosis of OA can usually be made clinically and then confirmed by radiography. The main features that suggest the diagnosis include pain, stiffness, reduced movement, swelling, crepitus, in elderly people (unusual before age 40) in the absence of systemic features (such as fever).Standard objective assessment of pathologic changes in the joint is typically accomplished *via* radiography to evaluate the presence of osteophytes

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and joint space narrowing. Radiographic evidence, however, has been shown to have variable predictive validity as a marker of subjective clinical pain, with some population-based studies[8,9] reporting weak correlations between the two.

On the other hand some studies reports strong correlations between radiographic features of knee OA and pain[10]. It has been documented that there is discordance between the severity of structural disease and symptom occurrence[7,11]. Hence we planned the study to evaluate our experience.

Objective:

Our objective is to evaluate the association of pain and functional limitations of a patient with OA knee with the severity of OA assessed by radiological grades.

Materials and Methods:

The study is a cross-sectional one. One hundred and twenty-three patients with knee pain who attended the PM&R OPD, JN Institute of Medical Sciences (JNIMS), Porompat, Imphal, during January 2013 to December 2014 and diagnosed as OA knee according to American College of Rheumatology Classification (ACR) Criteria and who satisfied the inclusion criteria were included in the study.Inclusion criteria were patient with knee pain in man and woman above age of 40 years, disease duration more than 3 months, and clinically and radiologically diagnosed as OA. These 123 were selected out of 210 patients of OA knee patients, 77 patients were excluded from the study for various reasons.

Table1: *Demographic Features, Clinical, and Radiological Characteristics of the Patients*

Age (years) (mean+ SD)	59.48 + 9.8
Gender:	
Female (No of cases; %)	96 (78.05)
Male (No of cases; %)	27 (21.95)
Disease duration (month) (mean +SD)	4.79 + 0.41
Kellgren – Lawrence scale:	
Grade I (No of cases; %)	14 (11.38)
Grade II (No of cases; %)	48 (39.02)
Grade III (No of cases; %)	44 (35.77)
Grade IV (No of cases; %)	17 (13.8)
WOMAC pain score (mean + SD)	8.15 (2.92)
WOMAC functional score (mean + SD)	29.28 (10.85)

WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index

Exclusion criteria were patients who underwent surgery in and around hip or knee, any history of knee trauma, inflammatory knee disorders and other arthropathies, metabolic bone disease, serious systemic disease, neoplasms, previous intra-articular (IA) injections, etc.

All the patients were explained about the study and informed consent was obtained from each patient before the study.

The presence of OA was assessed at baseline with clinical features and an x-ray of both knees AP (monopodal weight bearing) and lateral (semiflexed) views to support clinical diagnosis of OA and for staging according to Kellgren & Lawrence (KL) Radiological grading of OA. Initial pain and disability were assessed by the western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). WOMAC-A denotes pain, WOMAC-B denotes stiffness and WOMAC-C denotes disability. WOMAC -A scores were subgraded into 4 (GdI 0 to <25%, Gd II 25 to <50%, Gd III 50 to < 75%, Gd IV 75% and above). Similarly WOMAC-C scores were subgraded into 4, (Gd I 0 to <25%, Gd II 25 to <50%, Gd III 50 to < 75%, Gd IV 75% and above).

Again age distribution was grouped into 4 groups; Gr I 40 to 50 years, Gr II>50 to 60 years, Gr III>60 to 70 years and Gr IV>70 years.

Statistical analysis: SPSS 15 was used for the analysis of all the statistical data. Spearman's rank correlation coefficient was calculated to determine the relationship between WOMAC-A and KL grading, WOMAC-C and KL grading separately.

Results:

One hundred and twenty-three patients, with age range of 40 to 80 years (mean 59.48 + 9.8), male 27 and female 96, disease duration 4.79+0.41 months (Table1) ; side involved right 66 (53.7%), left 31(25.2%), and with both sides involvement in 26(21.1%) patients. Swelling was present in 49 patients (39.83%) and absent in 74 patients (60.16%).

Radiographical assessment,was done with KL grading, Gd I in 14 cases (11.38%), Gd II in 48 cases(39.02%), Gd III in 44 cases (35.77%), Gd IV in 17 cases (13.8%). Maximum cases were of grade II and III showing that most of the cases are in mild to moderate radiological features.

The correlation between WOMAC-A (pain) and KL grading was found to be statistically insignificant (r = 0.120) likewise WOMAC-C (disability) was also found to be insignificant (r = 0.325) as shown in Table 2.

Table 2: *Correlation Coefficient between WOMAC and KL Grading*

WOMAC	KL grade (r)
WOMAC-A	0.120
WOMAC-C	0.325

Correlation is significant at 0.01 level

Discussion:

In this study we would like to highlight the association between severity of OA knee assessed with radiological OA changes described in stages according to KL radiological grading of OA. Pain and functional assessment was done by WOMAC Osteoarthritis Index in a population of elderly man and woman attended in the PMR OPD JNIMS, with knee OA.We could not establish any association between WOMAC score of pain and disability and radiologic grading Kellgren-Lawrence grading scale.

KL grading is one of the accepted and frequently used methods of grading OA knee.

Kellgren& Lawrence Radiological Grading of OA[12]

Gd I: Doubtful narrowing of joint space and possible osteophyte lipping

Gd II: Definite osteophytes and possible narrowing of the joint space

Gd III: Moderate multiple osteophytes, definite narrowing of joint space and some sclerosis and possible deformity of the bone ends

Gd IV: Large osteophytes marked narrowing of joint space, sclerosis and definite deformity of the bone end.

The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) has been a widely used patient reported outcome in OA. Kersten *et al*[13] explored the internal validity and responsiveness of this scale and concluded that WOMAC pain and physical functioning subclass satisfied unidimensionality and ordinal scaling test and ability to transform to an interval scale. In this study we have converted WOMAC cardinal scale to interval scale as mentioned above.In this study we used this two well-accepted tools for the respective evaluations.

OA is the most common joint disorder due to ageing, wear and tear in the joint and causing disability among elderly population. And pain is the most common complaint among patients of knee OA leading to disability[14]. Devis *et al*[15] had commented that disability in a patient increases with the presence of pain. So while planning treatment it is necessary to know the factors that contribute to disability. McAlindon *et al*[16] have demonstrated that knee pain and age are more important determinants of functional impairments in elderly subjects than the severity of knee OA as assessed by radiography. Jordan *et al*[17] also concluded that knee pain severity was more important than radiographic knee OA in disability determination. Our study also shows that severity of knee OA as shown in the radiography is not related with the symptoms and we could not decide the treatment modality to be given on the basis of radiographic findings.

Amberson and Attur[3] and Cushnaghan and Dieppe[18] separately reviewed OA and confirmed that women are more likely to develop OA, more so after the age of 50 years, particularly in the knee, and the cause of this increase is poorly understood. In this study population M:F ratio is 9:32, that is there is strikingly high female patients as shown by others.

In many patients there are radiographic changes of OA but not symptomatic disease and on the other hand early painful OA may be unaccompanied by radiographic change, because changes on radiographs diagnostic of OA tend to occur relatively late in the disease course, after many pathologic changes have occurred in the joint.The severity of symptoms is poorly correlated with the severity of structural disease.

Felson[19] commented, cartilage damage is believed to be the hallmark of OA. However, since cartilage is an avascular, aneural tissue, the mechanisms of pain are likely to be complex and influenced by non-cartilagenous structures in the joint including the synovium, bone and soft tissue. Synovitis and bone marrow lesions, shown by imaging, may mediate pain. Mechanisms of pain perception may include the activation and release of local pro-inflammatory mediators such as prostaglandins and cytokines accompanied by the destruction of tissue, which is mediated by proteases.

However, clinically, there is often disparity between the degree of pain perception and the extent of joint changes in subjects with OA. Felson and Zhang[5] opined that the discordance between the severity of structural disease and symptom occurrence can be because plain

radiographs do not image joint structures innervated by pain fibres; cartilage loss, the pre-eminent pathologic feature leading to joint space narrowing on radiographs, is unaccompanied by any pain. And symptoms and structural changes are different phenomena. Pain is a consequence of activities, of psychologic and other causes of distress, and of pain thresholds. In OA, pain and disability also may be related to muscular weakness, which is not reflected in most imaging studies.Larsson *et al*[20] also reported that radiographic diagnosis of OA was not related to functional capacity. Similar to these findings we found no correlation between pain, functional impairment and radiographic features.

Finan *et al*[11] concluded that their findings support the notion that central sensitisation is an endophenotype for chronic pain in knee OA and contributes to the ongoing debate surrounding the variable association of clinical pain and radiographic sverity of knee OA.

Clinical features and radiological findings are important for proper diagnosis and management. But if we depend only on the radiological features for diagnosis and management of knee OA this will lead to unnecessary exposure/intervention to different modalities of therapy and thereby increasing cost of therapy. Patients with radiographic evidence of OA may be asymptomatic at any time and on the other hand in early OA with no radiologically identifiable structural changes extreme pain can be experienced. There are conflicting study reports that shows no association between pain, disability score and radiological findings[7,9] and others with good correlation between knee pain and radiographic features[10,16]. In our study we also found that there is no significant association between OA knee pain, disability and radiographic features.

Limitations of Study:

Study design is a cross-sectional study with less number of patients.We analysed only WOMAC pain and disability. WOMAC stiffness, correlation between age, sex, duration of disease, body mass index and radiological grade not analysed.

Conclusions:

We conclude that radiological grading with plain x-ray for OA knee and pain and functional impairment do not have significant correlation. We should not depend only on radiological features and we should rather consider the functional status while making the treatment decision of OA knee. Further longitudinal research with more number of patients is required.

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