*Original Article*

# Study on the pattern of radiological changes in osteoarthritis of knee joint

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***Abstract***

*Knee osteoarthritis (OA) is one of the frequent and functionally impairing disorders of the musculoskeletal system and characterized by an imbalance between the synthesis and degradation of the articular cartilage. The present study was conducted on the pattern of radiological changes in OA of knee joint patients attending in the department of Physical Medicine & Rehabilitation of Bangabandhu Sheikh Mujib Medical University. Structural changes of articular cartilage were assessed by the sequence of changes in the knee joint manifested as sclerosis, osteophytes formation, and joint space narrowing and joint space erosion by a radiographic examination. Osteophytes were more common in medial condyle in 46-61 age group (73.68%) and male patients of some age group showed higher rate of development of osteophytes in intercondylar area. Narrowing of joint space were more in medial tibiofemoral compartment (59.82%) in the 46-61 age group (70.98%), where as erosion was found higher in medial tibiofemoral compartment (70%) and more in male patients (36%). The findings of this study as revealed by the standard radiographic imaging of formation of osteophytes, joint space narrowing and joint space erosion lead to the recommendation that the problem is increasing with age. However, more studies are required for the purpose specifying medical treatment using appropriate appliances under close supervision of a physical medicine specialist.*

**Key words:** osteoarthritis, radiological changes, knee joint, osteophyte

**Introduction**

Osteoarthritis is the most common joint disorder, characterized by an imbalance between the synthesis and degradation of the articular cartilage, leading to the classic pathologic changes of destruction of cartilage.[1] The breakdown and deterioration of cartilage leads to the formation of new bone at the joint surfaces (sclerosis) and margins osteophytes.[2] This process often results in joint pain and loss of mobility, which may lead to long term disability. Although osteoarthritis is considered a non-inflammatory form of arthritis, there can be a small inflammatory component. Knee osteoarthritis characterizes all degenerative changes of the knee joint and is a disease with a multi-factorial etiology. A primary and secondary form of knee osteoarthritis may be differentiated.[3]

When this disease is advanced it is visible on plain radiographs, which show narrowing of joint space (due to cartilage loss), osteophytes, and sometimes changes in the subchondral bone. This condition is strongly age-related, being less common before 40 years, but rising in frequency with age, such that most people older than 70 years have radiological evidence of osteoarthritis in some joints. Knee osteoarthritis is seen radiographically in 33% of the population older than 60 years of age,[4] and is responsible for a higher incidence of disability and limiting activities of daily living in the elderly.[5,6]

The clinical problems associated with these pathological and radiographic changes include joint pain related to use, short-lasting inactivity, stiffness of joint, pain on movement with a restricted range, and cracking of joints (crepitus). Pain is particularly important, and osteoarthritis is thought to be the biggest cause of the high rate of regional joint pain in older people. However, the correlation between radiographic evidence of osteoarthritis and the symptomatic disease is rather weak. This raises issues relating to the definition of the so-called disease and to the extent to which we should be studying the cause of joint damage, or the causes of pain and physical disability in older people.

In western countries, radiographic evidence of osteoarthritis is present in the majority of people by 65 years of age and in about 80% of those older than 75 years. Approximately 11% of people older than 64 years have symptomatic knee osteoarthritis.[7] Radiographs are characterized by marginal osteophytes, joint space narrowing, mal-alignment, subchondral sclerosis, and subchondral cyst formation.[8] The overall objective was to make an in-depth study on changes of articular cartilage in osteoarthritis of knee joint. The specific objectives was to find out the sequence of changes in articular cartilage of the knee joint during the disease process, to identify the factors responsible for the changes in articular

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cartilage, to assess the current prevalence rate of osteoarthritis of knee joint in Bangladesh and to find out and recommend ways of relieving pain in osteoarthritis of knee joint.

**Methods**

This prospective study was done in the department of Physical Medicine and Rehabilitation of Bangabandhu Sheikh Mujib Medical University on patients with osteoarthritis of knee joints of various age groups. Total three hundred patients have been taken for the study and only osteoarthritis patients were included in this study excluding the secondary causes of osteoarthritis. All the patients were divided in three age groups as (30-45), (46-60) and (61-77) years respectively. Random sampling method was used for the study. Joint space narrowing is not seen on a traditional anteroposterior extension weight-bearing radiograph, but can be appreciated on a posteroanterior 45-degree flexion weight-bearing film. Subjects underwent weight-bearing postero-anterior radiography using the protocol of Buckland-Wright. This study has primarily examined the changes in articular cartilage of knee joint with osteoarthritis of aforesaid patients of Bangabandhu Sheikh Mujib Medical University. External factors that influence the changes of articular cartilage of knee joint are not considered here as some of which have significant implication of the study results.

**Results**

The study is sequentially presented here in quantitative and graphical forms. In this study radiographic findings of the 300 study population were analyzed by the following tables, where different changes of the articular cartilage were found according to the age and gender of the study population.

In case of medial condyle, osteophytes occurred maximum in age group of 46-61 years and the percentage was 73.68%. On the other hand osteophytes occurred in age group of 30-45 years and 62-77 years and percentage is 14.37% and 13.77% respectively. From the result it was found that osteophytes can occur within joints that do not develop any other structural changes typical of osteoarthritis[13,14] (Table-I).

**Table-I:** Distribution of osteophytes in different age group

| Distribution of osteophytes | Age group | | | Total |
|---|---|---|---|---|
| | 30-45 years | 46-61 years | 62-77 years | |
| Medial condyle | 8(14.03%) | 42(73.68%) | 7(12.28%) | 57 (19%) |
| Lateral condyle | 7(14%) | 35(70%) | 8(16%) | 50 (16.66%) |
| Inter condylar | 24(14.37%) | 120(71.85%) | 23(13.77%) | 167 (55.66%) |
| All | 6(23.07%) | 15(57.69%) | 5(19.23%) | 26 (8.66%) |
| | | | | N=300 |

In this study osteophytes were found in three distributions: medial condyle, lateral condyle and inter condylar area. In medial condyle, osteophytes occurred 57.89% in case of male and 42.10% in case of female. In lateral condyle, osteophytes occurred 56% in case of male and 44% in case of female. Inter condylar osteophytes occurs 59.28% in case of male and 40.71% in case of female. Inter condylar osteophytes were high in both sexes (55.66%), then medial condyle (19%) and lateral condyle (16.66%) respectively (Table-II).

**Table-II:** Distributions of osteophytes among gender group

| Distribution of osteophytes | Gender group | | Total |
|---|---|---|---|
| | Male | Female | |
| Medial condyle | 33(57.89%) | 24(42.10%) | 57 (19%) |
| Lateral condyle | 28(56%) | 22(44%) | 50 (16.66%) |
| Inter condylar | 99(59.28%) | 68(40.71%) | 167 (55.66%) |
| All | 14(53.84%) | 12(46.15%) | 26 (8.66%) |
| | | | N=300 |

Joint space narrowing occurs in three distributions e.g. Inter condylar area, medial tibio femoral and lateral tibio femoral compartment. In case of inter condylar area, joint space narrowing occurs maximum in age group 46-61 and the percentage was 70.98% and in age group of 30-45 years and 62-77 years the percentage were 12.05% and 17.85% respectively. Medial tibiofemoral joint space narrowing occurred maximum in age group of 46-61 years and the percentage was 70.98% and in age group 30-45 years and 62-77 years the percentage were 15.62% and 13.39% respectively. In lateral tibiofemoral, joint space narrowing occurred maximum in age group of 46-61 years and the parentage was 70% and in age group of 30-45 years and 62-77 years the percentage is 15% and 15% respectively (Table-III).

**Table-III:** Distribution of joint space narrowing in different age group

| Distribution of joint space narrowing | Age group | | | Total |
|---|---|---|---|---|
| | 30-45 | 46-61 | 62-77 | |
| Inter condylar area | 7(12.5%) | 39(69.64%) | 10(17.85%) | 56 (18.66%) |
| Medial tibiofemoral | 35(15.62%) | 159(70.98%) | 30(13.39%) | 224 (74.66%) |
| Lateral tibiofemoral | 3(15%) | 14(70%) | 3(15%) | 20 (6.66%) |
| | | | | N=300 |

In case of medial tibio femoral area joint space narrowing occurred 59.82% in male and 40.17% in female. In case of lateral tibio femoral area joint space narrowing occurred 50% in male and 50% in female. Medial tebiofemoral joint space is the common area of narrowing in both sexes and is 74.66% (Table-IV).

**Table-IV:** Distribution of joint space narrowing among gender group

| Distribution of joint space narrowing | Gender group | | Total |
|---|---|---|---|
| | Male | Female | |
| Inter condylar area | 30(53.57%) | 26(46.42%) | 56 (18.66%) |
| Medial tibiofemoral | 134(59.82%) | 90(40.17%) | 224 (74.66%) |
| Lateral tibiofemoral | 10(50%) | 10(50%) | 20 (6.66%) |
| | | | N=300 |

Joint space erosion occurs in three distributions e.g. inter condylar area, medial tibio femoral and lateral tibio femoral. Medial tibio femoral joint space erosion occurred maximum in age group of 46-61 years and the percentage was 70% and in the age group of 30-45 years and 62-77 years the percentage were 14.28% and 15.71% respectively. In lateral tibio femoral, joint space erosion occurred maximum in age group of 46-61 years and the parentage was 68.33% and in the age group of 30-45 years and 62-77 years the percentage were 16.66% and 15% respectively. In case of inter condylar area, joint space erosion occurs maximum in age group 46-61 and the percentage is 65.45% and in age group 30-45 years and 62-77 years the percentage are 13.63% and 20.90% respectively. In this study joint space erosion were found most in lateral tibio femoral - 40%, then inter condylar - 36.66% and medial tibio femoral area - 23.33% (Table-V).

**Table-V:** Joint space erosion in different age group

| Distribution of joint space erosion | Age group | | | Total |
|---|---|---|---|---|
| | 30-45 | 46-61 | 62-77 | |
| Medial tibiofemoral | 10(14.28%) | 49 (70%) | 11(15.71%) | 70 (23.33%) |
| Lateral tibiofemoral | 20(16.66%) | 82(68.33%) | 18(15%) | 120 (40%) |
| Inter condylar area | 15(13.63%) | 72(65.45%) | 23(20.90%) | 110 (36.66%) |
| | | | | N=300 |

In this study 138 (60%) male, 92 (40%) female patients showed intact joint space in radiographic examination of their knee joint. On the other hand, 36 (51.42%), male and 34 (48.57%) female patients showed marked erosion (Table-VI).

**Table-VI:** Joint space erosion in male & female

| Joint space erosion | Gender group | | Total |
|---|---|---|---|
| | Male | Female | |
| Joint space intact | 138 (60%) | 92 (40%) | 230 (76.66%) |
| Erosion present | 36 (51.42%) | 34 (48.57%) | 70 (23.33%) |
| | | | N=300 |

**Discussion**

In the study radiographic finding of the 300 study population were analyzed by the tables, where different changes of the articular cartilage were found according to the age and gender of the study population. However, most epidemiological studies have identified pain as a consistent feature of knee OA that correlates with radiographic progression,[9,10,11] and it has recently been demonstrated as an early feature of OA even in the absence of radiographic change.[12]

Osteophytes, also called bone spurs are protrusions of bone and cartilage. The bony projections are commonly seen in areas of degenerating joint and can be seen on x-rays. In this study cartilage changes, as revealed by the different radiographic changes in the knee joint, were studied among 300 patients attended at the three tertiary level hospitals in Dhaka, Bangladesh. Among 300 patients 174 (58%) were male and 126 (42%) female with a ratio of 1:38:1.

On analyzing the radiograph it was found that osteophytes are more common in males in the medial condyler area at the age group of 46-61 (74%) years. This study also reveals that joint space narrowing occurs mostly in the age group of 46-61 (71%) years and involves the medial tibiofemoral compartment rather than lateral tibiofemoral compartment or intercondylar area. Joint space erosion is a late complication of OA knee. This study also found that joint space erosion occurred mostly in the age group of 46-61 (75%) years and involves the medial tibio femoral compartment rather than lateral tibio femoral compartment or intercondylar area.

Osteoarthritis is a chronic progressive disabling disease of the older age. So, early detection of cases is very important to modify the life style as well as the risk factors to half the progression of the disease process. A standard radiographic examination of the patients having knee pain after the age of 30 years should be considered for the early detection of changes within the joint. A large scale population based study is warranted to estimate the real burden of Osteoarthritis-related disability by observing the sequence of changes in the knee joints of the study population.

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