

KNEE OSTEOARTHRITIS REVISITED; BUT ONLY AFTER KL GRADING IS TESTED: A RETROSPECTIVE ANALYSIS

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ABSTRACT

Background: Osteoarthritis (OA) of knee is one of the major causes in musculoskeletal condition leading to functional loss in patients. Determining the progression of the disease is a useful tool which will help in planning of exercise programme to slow or halt the disease progression. Measuring the joint space width of the tibio-femoral joint is one of the best options for knowing the disease progression and helps in designing exercise programme. **Aim:** Retrospective measurement of joint space width in patients with bilateral tibiofemoral osteoarthritis of knee joint. **Methodology:** Data was retrieved from the picture archiving and communication system (PACS) from 1st of February to 22nd of June 2018. Radiographs that were showing OA knee features by using Kellegren Lawrence (KL) grading system were considered and the joint space between the tibial and femoral compartment were measured. **Result:** The joint space width showed more reduction in the medial compartment of the joint as compared to the lateral compartment. **Conclusion:** In rural population of Maharashtra the medial joint space is markedly decreased as compared to the lateral compartment of the tibiofemoral joint and as the KL grade increases the joint space width decreased.

Keywords: Osteoarthritis; Knee; Joint space width; Rural Maharashtra.

INTRODUCTION

Osteoarthritis (OA) is the major chronic musculoskeletal condition leading to disability worldwide [1]. Epidemiological studies done estimated around 43 million affected populations in the United States alone and about 15% of the world population [2]. It is on the top of the list causing activity limitation and absent among working-age adults and is associated with a significant decline in function among older individuals. The knee being the most common weight bearing joint, 10% to 15% of all adults aged over 60 with the prevalence higher among women than men. In India the prevalence is 28.7% with the medial compartmental OA being the commonest cause of disability [3]. In rural Maharashtra the 21.6 % of the population is affected with knee OA [4]. The Tibiofemoral joint being the most common affected joint of the knee complex.

In osteoarthritis there is failure of the chondrocytes to maintain homeostasis between synthesis and degradation of the extracellular matrix components of the articular cartilage [5]. Repetitive compressive stress causes wear particles to form. Initially due to enzymatic activity there is engulfing of the wear particles by the macrophages. But over a prolong period this wear particle themselves become inflammatory mediators. Initially there is cartilage softening, and in the long run due excessive stress on the articular cartilage there is total destruction [6]. Also, there is thickening of the synovial

lining cell layer, increased vascularity and inflammatory cell infiltration [7]. The process of pathological progression is accelerated if activities which requires repetitive and excessive bending of the knee. There by increasing the compressive force in the tibiofemoral joint and thus leading to compartmental loading. All the above changes lead to decrease in joint space in the long run [8]. And the compartmental loading in the long run also affects the foot complex adversely. There by making the patient more disabled in their activities of daily living. Various methods for imaging the joint have been proposed and is extensively used in clinical setting and in research work.

Among these are, radio-imaging technique, ultrasound, magnetic resonance imaging and computed tomography. But it is generally considered that measurement of joint space width (JSW) is the current the best available option for evaluation of the progression of cartilage destruction. In a study done by Ismail et al 30° fixed-flexion erect knee computed radiographs were taken in 160 Nigerian population and the normal reference value for medial and lateral joint space width was found. The Kellegren and Lawrence (KL) grading system is valid and reliable measure to quantify the severity of OA knee [9].

The aim of all the treatment strategies available until date is to slow the progression of the disease. Exercise has a major role achieving this aim. The treatment option available for decreasing the disease progression is through physiotherapy. Various treatment protocol such quadriceps strengthening, electrotherapy modalities have been proven which improves the pain and function in patients with knee OA. The available studies where the treatment protocol aims at normalization of the knee alignment with respect to other joints proximal and dis-



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tal to it are knee stabilization exercises neuromuscular training. Other treatment options available are orthotic modification such as knee brace, shoe insert, medial arches which aims at normalizing the foot posture with regards to the knee. And if the joint space width is measured in patients with knee osteoarthritis before the treatment is given and after a certain period, did the treatment help in halting or decreasing the rate of progression of the disease in patients with OA knee can be known. And also, the KL grading as it determines the severity and thus can be helpful in determining the level of physiotherapy therapy treatment that has to be administered to the patients. There is scarcity of studies done in India measuring joint space width in patient population diagnosed with OA knee. And there is lack of evidence done in Maharashtra and that too in rural population

Thus, the aim of this study is to the measurement of joint space width in patients with bilateral medial compartment osteoarthritis of knee joint. And to find the correlation of the severity of the disease by using KL grading with the joint space width.

MATERIAL AND METHODOLOGY

Study design: Retrospective descriptive study

Ethics approval: Ethical clearance was obtained from the institutional review board.

Place of research: This study was carried out in Vikhe Patil Medical Hospital, Ahmednagar, Maharashtra.

Study period: Dated from February to June 2018.

Sample size: With confidence level of 95% from the prevalence of OA knee in rural Maharashtra [4], sample size for this study is 266. In these 141 x-rays of female and 125 X-rays of male.

Inclusion criteria: Only those x-rays were included which were taken in standard Antero-posterior view. And only x-rays in which the medial tibiofemoral compartment was affected were included in the study and the age beyond 45 years both in males and female.

Exclusion criteria: The x-ray showing any fracture of the lower limb bones or any other surgical implants, bone or joint infection were excluded.

Measurement method: Then digital radiographs 532 knees were retrospectively studied Using the picture archiving and communication system (PACS) the x-rays were retrieved Through the X-ray machine with the exposure of 300mA the x-ray beams were passed where the subjects were in standing weight bearing position. The distance between the cassette and the source was 100 cm. Joint space width was measured by measuring of the inter bone distance at its narrowest point (minimum JSW), both at the medial and the lateral compartment of the tibio-femoral joint.

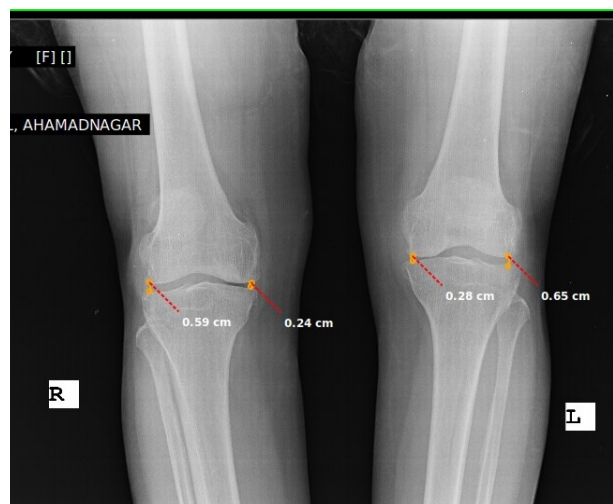


Fig 1: Measurement of joint space width.

Statistical analysis: Statistical analysis was done by using GraphPad InStat.

RESULTS

This study included 266 radiographs with cases of diagnosed OA knee on KL grading. Table 1 is showing the baseline characteristic of the individual whose radiographs. 141 radiographs of female whereas 125 radiographs of males. Table 2 shows the severity of the studied radiographs of the left and right knee. Table 3 is showing the mean age of the radiographs of males, the medial and lateral joint space for both the right as well left joint. Table 3 is showing the mean age of females, the medial and lateral joint space for both the right as well left joint. Fig 2 is showing the negative correlation of left knee joint KL grading with the left medial joints space width (MJSW). Fig 3 is showing the negative correlation of left knee joint KL grading with the left lateral joints space width (LJSW). Fig 4 is showing the negative correlation of right knee joint KL grading with the right medial joints space width (MJSW). Fig 5 is showing the negative correlation of left knee joint KL grading with the left lateral joints space width (LJSW). Table 4 showing the correlation coefficient of joint space width with the KL grading.

Table 1: Baseline Characteristics

	Number	Age
Males	125	60.5±6.8
Females	141	59±7.3

Table 2: Severity of the Osteoarthritis using Kellegran Lawrence grading

KL grade	% of Left knee	% of Right knee
1	9	10
2	27	20
3	43	49
4	21	21

Table 3: Value of joint space width in knee radiographs of female, male patients

	Female		Male	
	Left	Right	Left	Right
Age	59±7.3		60.5±6.8	
K/L	2.81±0.9	2.87±0.87	2.66±0.86	2.71 ±0.87
MJSW	0.16±0.15	0.16±0.14	0.2±1.55	0.23 ±0.16
LJSW	0.43±0.20	0.46±0.2	0.44± 0.17	0.46±0.19

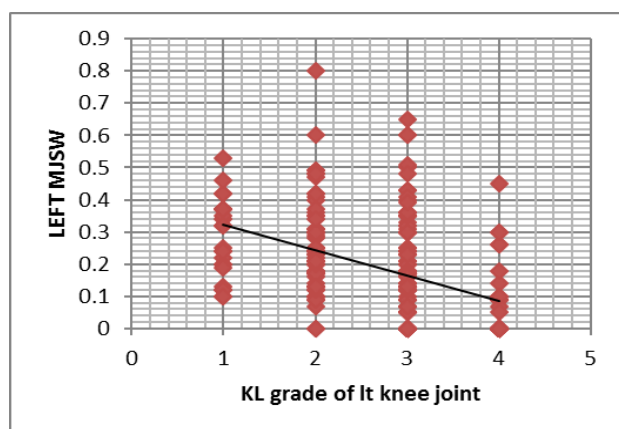


Fig 2: Correlation of K L grade with joint space width medial joint space width of left knee joint

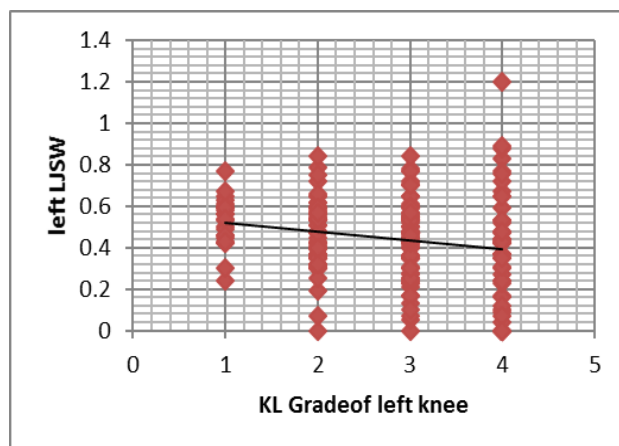


Fig 3: Correlation of K L grade with joint space width lateral joint space width of left knee joint

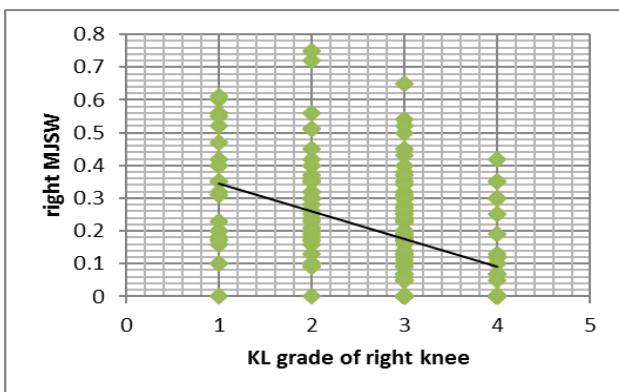


Fig 4: Correlation of K L grade with joint space width medial joint space width of right knee joint

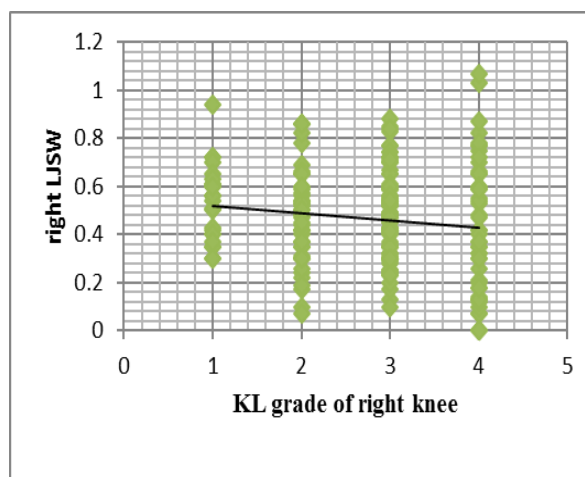


Fig 5: Correlation of K L grade with joint space width lateral joint space width of right knee joint

Table 4: Co-relation of KL grading with the joint space width

	R value	P value
Left KL grade with left MJSW	-0.2038	<0.0001
Left KL grade with left LJSW	-0.0385	<0.001
Right KL grade with right LJSW	-0.4637	<0.0001
Right KL grade with right MJSW	-0.1322	<0.023

(R = correlation coefficient, p value less than 0.05 considered as significant)

DISCUSSION

The primary aim of our study was to find the joint space width of the tibiofemoral compartment in patients with bilateral knee involvement. It was measured retrospectively using PACS and only those radiographs taken in Antero-posterior view were taken in standing position. The secondary aim was to find the co-relation of the severity of the disease by using KL grading with the joint space width. To the best of our knowledge this is the first study done in Indian population measuring joint space width. In our study the medial joint space is decreased considerably as compared to the lateral joint space width in all the studied samples. The reason for this considerable decrease in joint space width is due to the differences in the shape and orientation of medial condyle of the femur being more distal and bigger as compared to the lateral condyle and the medial tibial. During walking the external knee adduction moment is more thereby contributing to more compressive force [10]. The medial joint space is more loaded with compressive in many of the weight bearing activity such as unipedal stance, walking. Therefore, in already degenerated joint such that in osteoarthritis knee all such activities increases the compressive force, thereby reduction in joint space width [11]. Thus, the ability to dissipate loads and maintain joint congruity during weight-bearing activities decreases and lead to further changes in joint space width [12]. Many studies have been carried out in American, European population [13,14]. The

values of the medial joint space width of our study is less as compared to the studies done by Eric et al, this might be due to the differences in activities among different population [12]. And Indian using more of squatting in their daily activities [15]. Particularly, as the radiograph studied were of the population from rural Maharashtra. Thus, majority of the them would had been involved in farming activities which requires knee flexion squatting and cross leg sitting in maximum of their work hours and daily living [16].

As the KL grade increased the joint space width of the both the medial and lateral compartment tibiofemoral joint decreased. Our study shows similar results, in a meta-analysis done by Parastu et al where cohort studied were included. In their the study there was decrease in the joint space width with time [17]. Therefore, increase in KL with time. In our study, women showed more joint space reduction as found in studies done by Barton et al in American population [18]. This is due the mal-alignment at the knee and the weight gravity falling more on the medial side might explain high risk of medial compartment more commonly found in women as compared with men [19]. The studied radiograph was that in the age group beyond 45 years which is in the perimenopausal or the post-menopausal age group. The reason for marked decrease in joint space among the knees in women is the hormonal differences between men and women. This may play a role in the development of osteoarthritis. Decrease in estrogen being the important hormonal influence [20]. All these factors led to the decrease in medial joint space reduction more as compared to the lateral space.

CONCLUSION

The medial compartmental joint space width of the tibiofemoral joint is markedly reduced as compared to the lateral compartment of the tibiofemoral joint. Measures such as footwear modification and neuromuscular training which mainly aims at decreasing the disease progression in osteoarthritis of knee should be undertaken.

Limitation and future scope: As most of the studied radiograph were that of a individual with advanced disease. So future studies are to be done where the early stage OA can be studied for a particular period of time so that the effects exercise on disease progression when exercise are being administered as compared to when they are not being administered.

Conflict of interest: None

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