



CORRELATION BETWEEN ARTICULAR CARTILAGE THICKNESS AND QUADRICEPS ANGLE IN POSTMENOPAUSAL WOMEN WITH SYMPTOMATIC OSTEOARTHRITIS OF KNEE: GONIOMETRIC AND ULTRASOUND EVALUATION

Orthopaedics

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KEYWORDS

INTRODUCTION

Knee osteoarthritis is a debilitating condition affecting day-to-day activity with a female predominance^[1]. It is a multifactorial complex chronic degenerative disease marked by reduction in the articular cartilage thickness, development of osteophytes subchondral sclerosis, and a variety of alterations of biochemical and morphological changes to the synovial membrane and joint capsule. The overall global prevalence of knee OA was found to be 16.0%^[2]. And the prevalence of OA knee in some of the major Indian cities where found to be as, Agra (35.5%) followed Kolkata (33.7%), Dehradun (27.2%) Bangalore (26.6%), and Pune (21.7%).^[3] In view of the available literature, The medial tibiofemoral and patella femoral articular cartilages in healthy persons with appropriately aligned knees are thinner than the lateral tibiofemoral cartilage.^[4,5] The Most common reason behind this was in the pattern of distribution of weight over the medial and lateral compartments of knee.^[6,7] Having osteoporosis significantly raises the risk of increasing joint deterioration if one already has osteoarthritis, despite the fact that it may protect against developing the condition.^[8] The number of years after menopause was more significantly connected to decreased knee cartilage volume than age, suggesting an influence of the hormonal state on knee cartilage that was more pronounced than the effect of age alone, according to a study of cartilage volume in postmenopausal women.^[9]

Quadriceps angle (Q-angle) is a significant determinant of knee health. The quadriceps angle (Q-angle) is defined as the intersection of two outlines, one of which starts at the anterior iliac spine and extends to the patella's centre and the other of which starts at the tibial tuberosity and extends to the center of patella.^[10] The alignment and mechanics of the lower limb vary between men and women because of physical variables such as height, leg length, and hip breadth. The quadriceps muscle angle is an anatomical factor that affects alignment in the lower leg (q-angle)^[11]. Traditionally, MRI, regarded as the gold standard, is used to quantify the articular cartilage thickness, which is an indicator of the various stages of knee osteoarthritis can often be expensive and inaccessible. Even though readily available, X-rays can only provide a gross picture of the narrowing of the joint space. Compared to other modalities, ultrasound offers a different quantitative method for measuring cartilage thickness that is more accessible, inexpensive, and simple to utilize, with significant levels of correlation between the ultrasound and MRI findings^[12]

AIMS & OBJECTIVES

To investigate the correlation between Goniometric Quadriceps angle and Articular cartilage thickness in postmenopausal symptomatic osteoarthritic women

METHODOLOGY

A Prospective Hospital based study was conducted among 49 cases of symptomatic osteoarthritis of knee presented at R.L. Jalappa Hospital Centre in the duration of April 2022 – September 2022. Institutional Ethical Committee approval was taken before the initiation of the study. Written informed consent was taken from all participants before participating in the study.

Based on the study conducted by Yşe aydemir ekim, Hatice hamarat and Ahmet musmul et al,^[13] considering a confidence interval of 90% and power of 80% and using the variable medial femoral condyle

thickness the sample size was estimated to be 49. The participants were divided into 2 groups constituted of the high Q-angle (q angle >15) and low q angle group (Q angle <15)

Inclusion Criteria

- All symptomatic postmenopausal women with the diagnosis of osteoarthritis of the knee according to revised criteria established by the "American College of Rheumatology were enrolled"^[14]

Exclusion Criteria

- Limb length discrepancy
- Internal derangement of the knee (IDK)
- Recurvatum knees
- Kyphosis and scoliosis
- Previous surgeries to lower limb
- Steroid abuse/ Immune-compromised state
- Infectious/ neoplastic condition

Data Collection And Analysis

Data collection was done by using a semi-structured case record form. It included all the relevant history, clinical details, and examination findings of patients. The Q-angle was determined in the symptomatic subjects using a full-circle goniometer with the patient in erect standing posture. Three landmarks were located by palpation: the anterior superior iliac spine (ASIS), the center of the patella, and the tibial tubercle (TT). The center of the patella was located by the intersection of a line from the medial to lateral aspect through the widest part of the patella and a line from the superior to inferior aspect connecting the base and the tip of the patella. The long arm of the goniometer was placed along the line connecting the anterior superior iliac spine with the center of the patella, and the short arm was kept along the line connecting the center of the patella with the tibial tubercle. The thickness of the articular cartilage was taken from the mid-points of the medial femoral condyle, intercondylar area, and lateral femoral condyle. The cartilage thickness was measured as the distance between the thin hyperechoic line at the synovial space-cartilage interface and the sharp hyperechoic line at the cartilage-bone interface.

Data was entered into an MS excel sheet and analyzed using SPSS software version 24. Data was described as the mean $\pm$ standard deviation for discrete variables and as the median for ordinal variables. Correlations among Goniometric Q-angle clinical and articular cartilage thickness imaging findings were assessed by using Spearman's correlation coefficient. Statistical significance was set at $p < 0.05$.

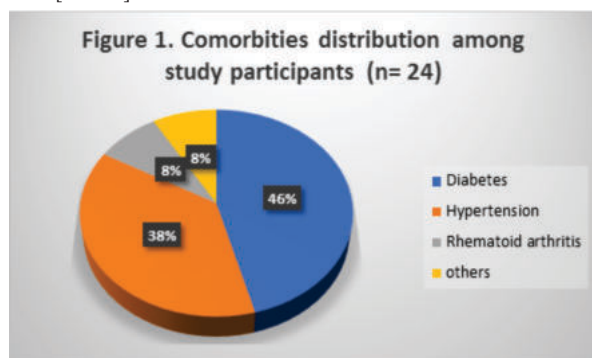
RESULTS

Table 1. Distribution Of Various Parameters Among Study Participants (n=49)

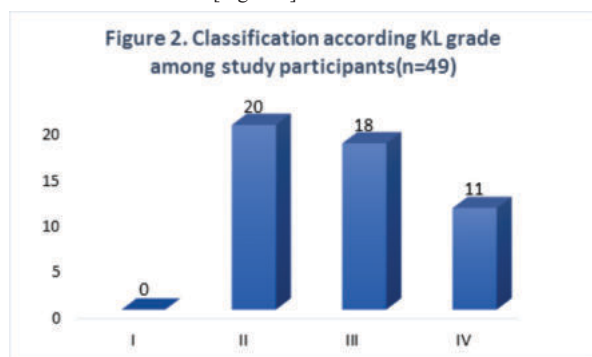
Variables	Mean $\pm$ SD
Age	58.33 $\pm$ 9.5
Q- angle	17.21 $\pm$ 0.84
Medial Femoral Condylar thickness	1.6 $\pm$ 0.26
Lateral Femoral Condylar thickness	1.8 $\pm$ 0.2
Intercondylar area	2.05 $\pm$ 0.11

Among the total 49 study participants, the mean age was 58.33 $\pm$ 9.5 years. The mean Q angle was 17.21 degrees assessed in patients. The mean Medial and lateral femoral condylar thickness was 1.6, and 1.8,

respectively. The mean space between the Intercondylar region was 2.05. [Table 1]



Out of total, only 24 patients had history of comorbidities. Majority 46% had diabetes followed by hypertension. Only 2 cases had history of Rheumatoid arthritis. [Figure 1]



Of the total, 20 cases had grade II as per KL classification, followed by 18 participants in Grade III and 11 participants in grade IV. [Figure 2]

Table 2. Comparison Of Clinical And Ultrasound Findings Of Study Participants

Variables	Low Q angle (<15°) n(n=11)	High Q angle (>15°) (n=37)	P- value
Medial Femoral Condylar thickness	1.7 + 0.25	1.6 + 0.26	0.003
Lateral Femoral Condylar thickness	1.88 + 0.18	1.84 + 0.21	0.001
Intercondylar area	2.1 + 0.10	2.04 + 0.11	0.045

Of the total participants, 37 had high q- angle over 15 degrees. Positive spearman's correlation (r) was found between high q angle and articular cartilage thickness. [Table 2]

DISCUSSION

Our study consists of the specific study population of postmenopausal women from a rural background who presented to the opd with complaints of persisting knee pain. On further evaluation, it was observed that most of the cases presented with a Kellegren Lawrence grade 2 osteoarthritis on radiographic findings. In a study done by Szebenyi B et al,^[15] on the association between pain, functional mobility and radiological findings in OA of knee. The majority of patients were above 55 years of age, and there was no significant difference was found between K/L scoring and both medial and lateral compartment mobility.

In the study conducted by Guerra JP et al.^[16], the mean q angle was found to be 18 degrees. In the present study, among the 49 study participants, the mean age was 58.33 ± 9.5 years. And the mean Q angle was 17.21 degrees assessed in patients. While in study conducted by Tsakoniti AE et al., eight similar findings were observed.

The mean Medial and lateral femoral condylar cartilage thickness was found to be 1.6 mm and 1.8mm in this study. A research conducted by Eckstein F et al.,^[4] The mean cartilage thickness was 1.57 to 2.43 mm. The mean and maximal cartilage thickness were highest in the patella (2.76 mm and 5.72 mm). A significant correlation was found between the cartilage volume with the mean thickness (R=0.80) and with the joint surface areas (R=0.56), but not between the thickness and surface

area (R=0.37). In present study, Mean space between Intercondylar region was 2.05mm

Out of total, only 24 patients had history of comorbidities. Majority 46% had diabetes followed by hypertension. Only 2 cases had a history of Rheumatoid arthritis.

Out of total participants, 37 had high q- angle more than 15 degrees. There was positive spearman's correlation was found between high q angle and articular cartilage thickness. Almost same outcome was measured in study of Huberti HH et al.^[18] In the study of Karvonen RL et al,^[19] increase in age accounted for a significant linear decrease in both lateral and medial weight-bearing femoral cartilage thickness of both knees.

CONCLUSION

The Q-angle is widely used as an indicator of patella-femoral problems such as patella-femoral pain syndrome and osteoarthritis of knee. In symptomatic patients of Osteoarthritis knee, patella-femoral degeneration at the joint recurrently exists with tibiofemoral osteoarthritis. Patients with concomitant OA had more difficulty in mobility of joint and functional disabilities.

Musculoskeletal ultrasonography is a non-invasive, widely available, and relatively inexpensive technique. Articular Cartilage thickness measurements were done by using ultrasonography. In symptomatic osteoarthritis patients, articular cartilage was graded, and thickness was minimal in medial as well as lateral femoral condylar found in high Q angle patients. Also the space between Intercondylar region was decreased in high Q angle cases. There was positive correlation found between High Q-angle measurements and cartilage thickness measured by ultrasonography.

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