Original Research Article

Importance of clinical and radiological assessment of patient of osteoarthritis knee for optimum outcome in total knee replacement

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ABSTRACT

Background: Total knee replacement (TKR) provides symptomatic relief in patients with severe arthritis by removing pathologic joint tissue and restoration of the joint anatomy and function by the replacing with metal or plastic components leading to more stable biomechanics. Inspite of all advances in the surgical techniques 1 out of 5 people who undergo TKA remain unsatisfied. Clinical and radiological grading of osteoarthritis of knee may be an important prognostic marker to assess the outcome following TKR.
Methods: Study conducted was retrospective study. Pre-op routine and clinical assessment data noted from departmental records. Correlation between 'initial knee society score' (KSSi) and 'radiological severity' in terms of (Kellgren-Lawrence) grade and varus angle with 'change in knee society score' (ΔKSS) assessed to reach at conclusion.
Results: Lower KSS values, higher KL grading, higher femorotibial angle and were associated significantly with higher change in KSS values, i.e. better outcome.
Conclusions: Severe OA knee with high FTA and higher KL grade has shown better outcome following TKA. In early stages it is better to manage the patient conservatively with medications and physiotherapy.

Keywords: Arthroplasty, Knee society score, Kellgren and Lawrence classification

INTRODUCTION

Osteoarthritis (OA) knee, a degenerative disease of the knee joints, occurs as a result of continuous wear and tear leading to progressive loss of articular cartilage. Knee OA may be divided into two types: primary and secondary. Primary OA of knee is degeneration of articular surface without any known underlying reason. Secondary OA results either from abnormal concentration of forces across the knee joint as seen in case of post-traumatic causes or abnormal articular cartilage, as seen in inflammatory arthritis like rheumatoid arthritis (RA).[1]

OA is usually a chronic progressive disease that may ultimately lead to deformity and disability. While medications like disease modifying anti-rheumatic drugs (DMARDs) can help slow the progression of RA and other inflammatory arthritic conditions, no such disease-modifying agents exist for the treatment of OA of the knee joint. Treatment for knee OA can be divided into non-surgical and surgical management. Initial treatment begins with non-surgical modalities such as physiotherapy and medications and moves to surgical treatment once the non-surgical methods are no longer effective. Surgical treatment options includes high tibial osteotomy (HTO), unicompartmental knee arthroplasty (UKA) and TKR.[1]

TKR provides early symptomatic relief in patients with severe arthritis by removing pathologic joint tissue and replacing with metal or plastic components leading to restoration of the joint anatomy and more stable biomechanics. Even with appropriate techniques, newer technologic advancements, and improved understanding of knee kinematics, approximately 1 out of 5 people who undergo TKA remain unsatisfied.[2-4]

Clinical and radiological grading of osteoarthritis of knee may be an important prognostic marker to assess the outcome following TKR. According to consensus statement in 2015 medial UKA should be carried out only in cases of severe OA knee showing bone-on-bone contact on preoperative radiographs.[5] Currently no such guidelines exist for TKR as very few studies were conducted on it till date. Therefore, there is a need of study to evaluate the importance of clinical and radiological assessment of patients of osteoarthritis knee for optimum outcome in TKR surgery.

Aim and objectives

The objectives of the study are to look for appropriate timing of surgery for optimum outcome following TKR and to find if advanced clinical and radiological stage of disease yields better results following TKR.

Inclusion and exclusion criteria

All patients with osteoarthritis of knee with or without deformities who has already undergone TKR in the age group 45-90 years were included in the study. Patients with sepsis of the knee joint, local skin lesions, post traumatic osteoarthritis and neurovascular disorder of involved lower limb were excluded from the study.

METHODS

To evaluate the importance of clinical and radiological assessment of patients of osteoarthritis knee for optimum outcome in TKR, a retrospective study was conducted in departments of orthopaedics in a tertiary care public hospital in Mumbai. The patients who underwent surgery during 18 months of study period (1st June, 2021 to 30th November, 2022) were interviewed after taking their consent at their convenient time. Pre-operative routine and clinical assessment data was noted from departmental records. The study was done with institutional ethics committee approval.

Study design

The list is prepared for patients who underwent the TKR surgery. Their basic details and pre-op assessments are noted from the departmental records retrospectively. They were followed up with the post-op evaluations and interviewed maintaining proper privacy after taking written consent. In this study we assessed the correlation between 'initial knee society score '(KSSi) and 'radiological severity 'in terms of KL grade and varus angle with 'change in knee society score '(ΔKSS) to reach at the conclusion.

Sample size calculation

In a 2016 study by Bhandarkar et. al. prevalence of TKR in OA knee patients was found as 4.23%, (p=0.0423).[6]

Using this data, sample size was calculated as follows: Sample size=$z^2p(1-p)/d^2$

For confidence interval of 95%, z=1.96 and d=0.05(5%),

Therefore, sample size=62.25=62 (rounded-off), thus, for the study the minimum number of patients required to enrol was 62. In our study 64 eligible patients participated.

Sampling technique

All the patients fulfilling the above-mentioned criteria were approached and recruited in the study after taking their consent. If a person rejects to participate in study next person in list is approached and sample size is achieved.

Clinical and radiological parameters of patients of osteoarthritis knee were assessed based on following criteria-

Clinical criteria: knee society score

Knee society scoring system is an open source, universally accepted, validated system that combines: a) an objective physician-derived component, b) a subjective patient-derived component that evaluates pain relief, functional abilities, satisfaction, and fulfilment of expectations.

This score prioritises the patient perspective, to better track patient expectations, satisfaction, and activity levels.[7]

Radiological criteria

Kellgren-Lawrence classification[8]

Table 1: Kellgren Lawrence classification.[8]

Grade	Description
0	No joint space narrowing or reactive changes
1	Doubtful joint space narrowing and possible osteophyte lipping.
2	Definite osteophytes and possible joint space narrowing.
3	Moderate osteophytes, definite joint space narrowing, sclerosis and possible bony deformity.
4	Large osteophytes, marked joint space narrowing, severe sclerosis and definite bone end deformity.

Varus assessment

In terms of- FTA-Femorotibial angle: The lateral angle between the axis of the femoral shaft and that of the tibial shaft. - LDFA- lateral dorsal femoral angle and - MPTA-medial proximal tibial angle
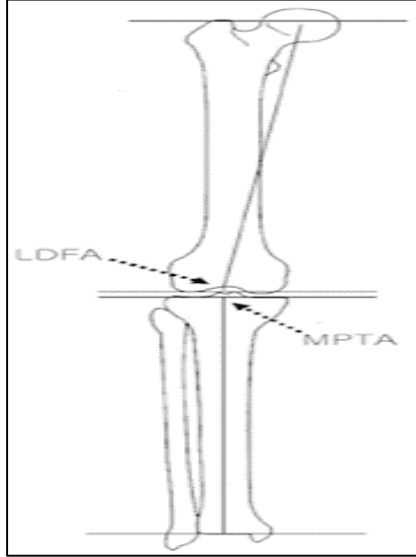

Figure 1: Schematic representation of LDFA and MPTA.

Hypothesis

H0 (null hypothesis): Clinical and radiological assessment of patient of osteoarthritis knee has no role for optimum outcome in TKR.

Ha (alternate hypothesis): Clinical and radiological assessment of patient of osteoarthritis knee has role for optimum outcome in TKR.
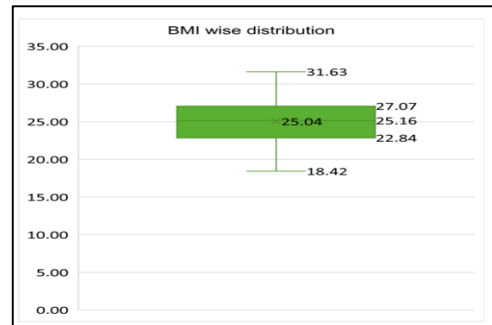
RESULTS

Mean BMI was found to be 25.04 ±3.05 kg/m^2.

Figure 2: Box and Whisker plot showing distribution of participants according to their BMI.

Table 2: General characteristics of the participants

Variables	Frequency	Percentage (%)
Age group (In years), (n=64)		
Age <50	6	9.38
50 to 59	26	40.63
60 to 69	22	34.37
≥70	10	15.62
Total	64	100
Gender, (n=64)		
Male	18	28.12
Female	46	71.88
Total	64	100
BMI category, (n=64)		
Underweight	1	1.6
Normal	30	46.9
Overweight	29	45.3
Obesity	4	6.3
Total	64	100
Side involvement, (n=64)		
Left	29	45.31
Right	35	54.69
Total	64	100
KL grading		
Grade 1	13	20.31
Grade 2	16	25.00
Grade 3	18	28.13
Grade 4	17	26.56
Total	64	100

Correlation of change in KSS with preoperative KSS values

While correlating change in KSS with preoperative KSS values, a significant negative correlation was seen. This implies that lower KSS values were associated significantly with higher change in KSS values i.e. better outcome in terms of KSS score postoperative.
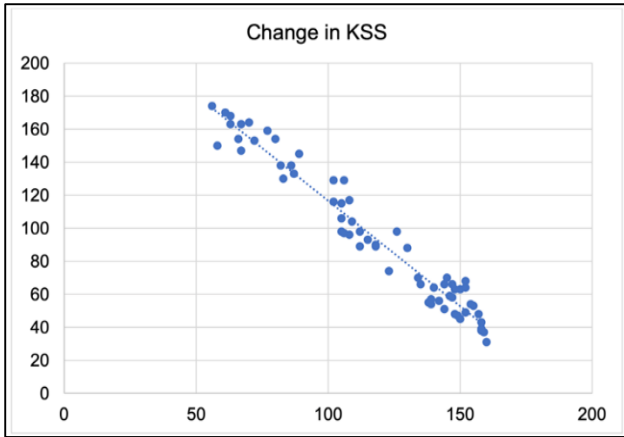

Figure 3: Correlation of change in KSS with preoperative KSS values.

Pearson correlation (r=-0.9775, p<0.001; significant) showing strong negative correlation at 0.01 level.

Correlation of change in KSS with preoperative KL grading

While correlating Change in KSS with preoperative KL grading, a significant positive correlation was seen. This implies that higher KL grading was associated significantly with higher change in KSS values i.e. better outcome in terms of KSS score postoperative.
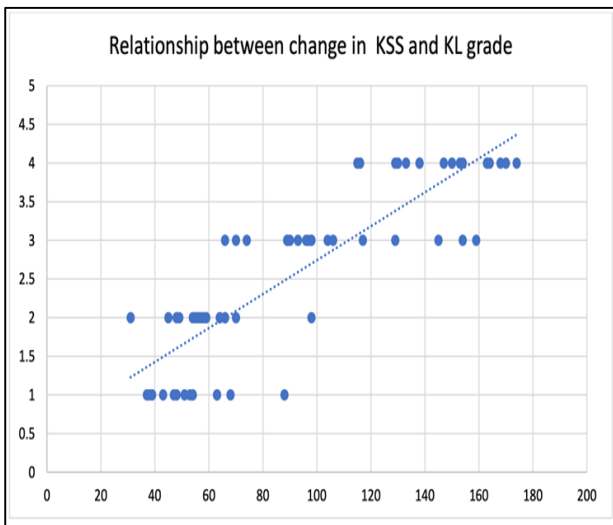

Figure 4: Correlation of change in KSS and preoperative KL grade.

Spearman correlation (correlation coefficient: 0.876, p<0.001; significant) showing strong positive correlation.

Correlation of change in KSS with preoperative FTA value

While correlating Change in KSS with preoperative FTA value, a significant positive correlation was seen. This implies that FTA value was associated significantly with higher change in KSS values i.e. better outcome in terms of KSS score postoperative.
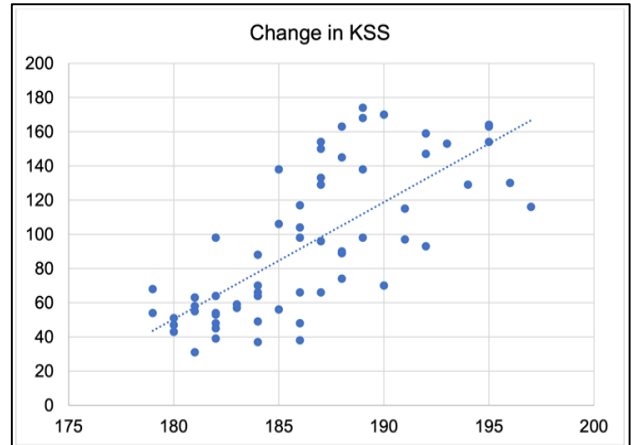

Figure 5: Correlation of change in KSS with preoperative FTA value.

Pearson correlation (r=0.730, p<0.001; significant) showing strong positive correlation.

DISCUSSION

In the present study, while correlating change in KSS with preoperative KSS values, a significant negative correlation was seen. This implies that lower KSS values were associated significantly with higher change in KSS values. i.e., better outcome in terms of KSS score postoperative. Our results were in concordance with the results obtained by other previous authors who had also reported similar findings. In previous study conducted by Kahn et al authors studied 172 patients who underwent TKA.[8] For each patient, they compiled pre- and postoperative Western Ontario and McMaster university arthritis index (WOMAC) scores, femorotibial angles, anatomical side distal femoral angles, and anatomical medium proximal tibial angles and KL grades. Indeed, though in both the studies different scales were used to measure the outgrowth, findings were found to be analogous, i.e., worse knee will show better results post operatively.

Riis et al showed preoperative low-grade severity of OA was associated with a low functional level after TKA.[9] Based on this finding, they stated that avoiding premature surgery could help to reduce the number of patients who are dissatisfied following TKA. Similar results have been shown by several investigators that less severe

preoperative radiological OA was associated with a poorer outcome after TKAs.[10,11]

Nilsdotter et al described self-reported outcomes in terms of pain and physical function (PF) after TKR in Osteoarthritis knee (followed up to 5 years).[12] A total of 102 OA knee patients were recruited for TKR. The questionnaires which included Knee injury and Osteoarthritis outcome score (KOOS) and SF-36 were administered. Preoperative and postoperative data were collected. Patients who had their scores in the lowest quartile preoperatively in the KOOS sub-scales pain and ADL (activities of daily living) made the greatest improvements to 1 year. Valdes et al describe similar results when they compared radiographic severity to postoperative outcome, reporting lower absolute postoperative WOMAC scores when preoperative KL grades were higher. In the present study also, a positive correlation is found between increase in KSS and KL grade.[13]

In the present study it is found that there is strong significant positive correlation present between change in KSS with preoperative FTA value (r=0.730, p<0.001). Means higher FTA value (severe varus knee) was associated significantly with higher change in KSS values i.e. better outcome in terms of KSS score postoperative. No similar data is reported in recent studies. Present study data can be used as reference data for further research.

In this study, clinical and radiological assessment of patient of osteoarthritis knee was found to have important role for optimum outcome in total knee replacement. Therefore, null hypothesis is rejected and alternative hypothesis is accepted.

Limitation

The present study has been conducted in a tertiary hospital of a metropolitan city. So, the results cannot be generalized for the peripheral hospitals.

CONCLUSION

Under the light of above obtained results, following conclusions were reached: (i) TKA has an excellent outcome in osteoarthritis; (ii) total knee replacement is a reliable and safe modality of treatment and can be performed with results comparable to the other global studies provided there is adequate expertise and follow up by the patient to detect any complications early, before they occur; and (iii) severe OA knee with high FTA and higher KL grade has shown better outcome following TKA.

Recommendations

hese are the recommendations we suggest based on the present study: (i) it is better to operate on arthritic knee at a more advanced stage with higher KL grade, more severe varus knee and lower knee society scores; and (ii) for OA knee in early stages it is better to manage the patient conservatively with medications and physiotherapy.

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