

LCS mobile bearing total knee replacement - A minimum 5yrs follow up study in tertiary care hospital, Kanchipuram

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Abstract

The aim of the present study is to LCS mobile bearing total knee replacement – A minimum 5 yrs follow up study. LCS design (Low Contact Stress; DePuy Orthopedics, Inc, Warsaw, Indiana) was introduced by Buechel and Pappas in 1977. The different variants available are meniscal bearing unicondylar knee, PCL retaining meniscal bearing knee, both cruciate retaining meniscal bearing knee and both cruciate-sacrificing rotatory platform knee. Greater freedom of motion is provided by the mobile -bearing (MB) TKA compared with the fixed-bearing (FB) variant, because natural femoral components movements are not restricted by the insert. This is a Retrospective observational cohort study. All patients who underwent Total Knee Replacement between 2017 to August 2022, in Department of Orthopaedics, Meenakshi Medical College Hospital and Research Institute, Kanchipuram will be identified from the operation register. All patients who satisfied inclusion criteria were selected and selected patients was recruited into the study after informed consent. Selected patients Out-patient and In-patient charts were assessed and all information gathered in a tabular form. In the present study we conclude that there was significant increases of pre op posterior condyle offset and post op posterior condyle offset.

Keywords: Low contact stress, Total Knee Replacement and mobile -bearing.

1. INTRODUCTION

The most commonly performed replacement surgery in lower limb is Total Knee Replacement (TKR)(1). Total knee replacement can treat a variety of pathologic conditions affecting the knee which will lead to pain relief, functional restoration, and finally to mobility. For patients having severe arthritis of the knee, TKR is typically done for relief of symptoms. Knee joint is a ginglymoid joint, permitting the following movements: flexion, extension, gliding movement and some amount of rotation [1]. It comprises three compartments: lateral compartment, medial compartment, and patello-femoral joint. Osteoarthritis results due to damage to the cartilage in the articular surfaces of the knee, which may be idiopathic or post-traumatic. It can also occur in inflammatory arthritis like rheumatoid, psoriatic, etc. Worldwide rates of Patients with osteoarthritis undergoing total knee replacements are about 90 percent [2].

TKR relieves pain resulting from arthritis. In patients suspected to have arthritis of the knee, radiographic findings must correlate showing severe joint destruction. Prior to considering surgery, conservative treatment measures including anti-inflammatory medications, activity modifications, and physiotherapy should have been tried and failed[3].

TKR has a limited survival expectancy which is determined by activity levels of the patient. It is indicated for young patients with crippling inflammatory arthritis and in the elderly with degenerative arthritis. Mobile bearing TKR, has a polyethylene insert that articulates with a metallic femoral component on the one side, and a metallic tibial tray on the other[4].

These implants were designed to provide articulation at dual surfaces. Mobile bearing knee replacement was introduced to decrease polyethylene fatigue tear. Conventional fixed bearing prostheses for the knee have proved successful clinically. Crucial problems with current fixed bearing knee prostheses in more active people are osteolysis and wear of the polyethylene component [5].

Polyethylene wear is of two types, articular wear is the first type. Articular wear is a complication in TKR surgery. Round-on-flat designs resemble normal motion of the knee joint. High contact stresses are exhibited on the polyethylene. High contact stresses by an unconstrained articulation with sliding and skidding movements results in polyethylene damage and delamination, and osteolysis results from wear particles. Design with more conformity of articulation decreases the articular type of polyethylene wear. Compromise between freedom of movement and conformity within the knee always occurs.

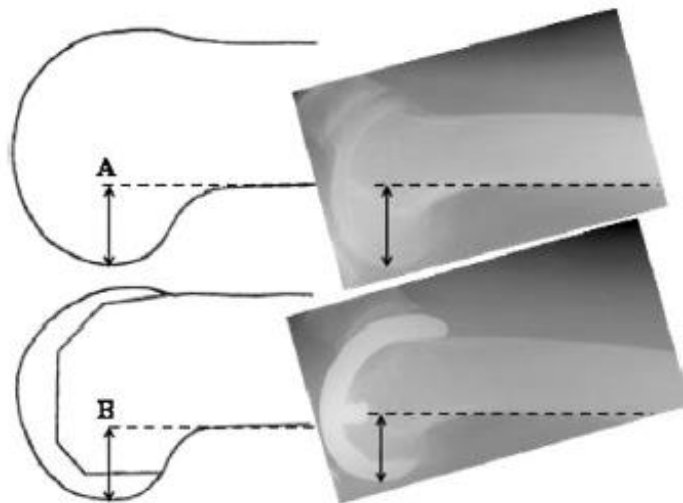
Kinematic penalty should be paid if there is reduction in the contact stress at articular surfaces. Rotations will be reduced as a result of increased contact area. Decreased rotations are acceptable in elderly patients but not in young and active patients[6].

2. Materials and Methods

This is a Retrospective observational cohort study. Patients who had undergone mobile bearing total knee replacement between 2017 to August 2021, in the department of Orthopedics, Meenakshi Medical College Hospital and Research Institute, Kanchipuram, were recruited into the study after informed consent. They were informed by telephone and post, to come for follow up in Ortho OPD. Their current clinical and functional scoring was calculated using the Knee Society Score. Plain Radiograph of knees, AP & lateral views was taken at the follow up visit and radiological assessment of the joint was done. Their pre op American Knee society score was obtained from the previous Inpatient chart. Other variables like Age of the patient, sex, occupation, duration of hospitalization were also analyzed during the follow up visit.

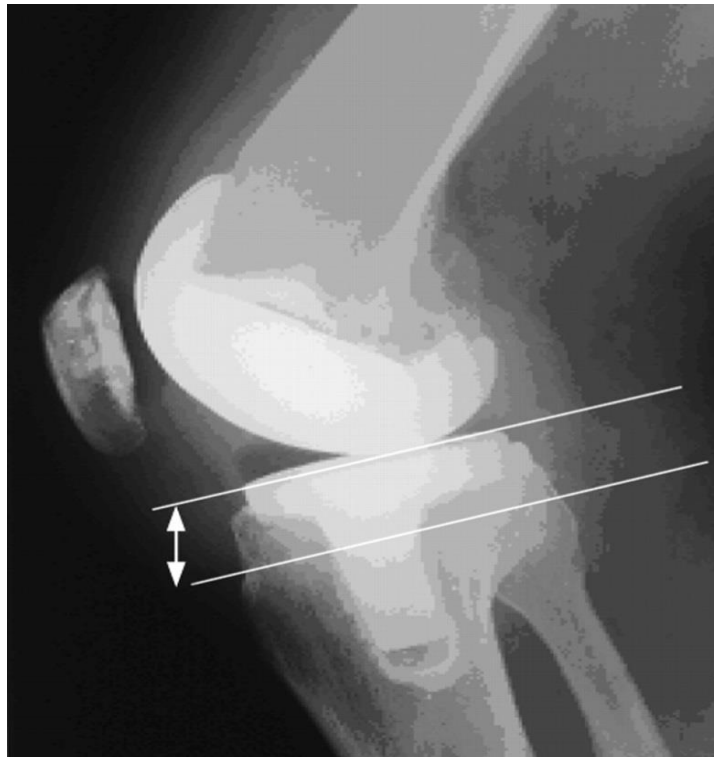
Measurement of Posterior Condyle Offset

Pre op and post op posterior condyle offset was assessed from the lateral x-ray by noting maximum thickness of posterior condyle of femur projecting to the tangent of the posterior cortex of the femoral head posteriorly. Pre op and post op measurements were compared. This is demonstrated in the following figure.



Joint line measurement

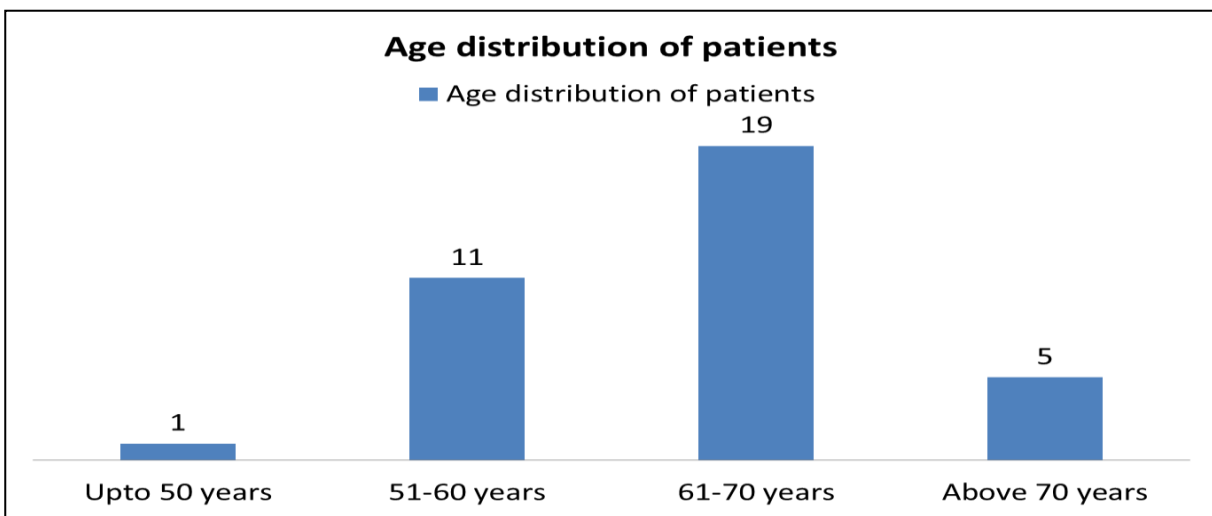
The joint line position was measured on the lateral radiograph using the method which was described by Figgie et al [7]. Measurement was made from the top of the tibial tuberosity to the superior surface of the tibial component. However due to radio lucency of the tibial insert, this point was taken to be the most distal part of the femoral component [8] .



3. Results

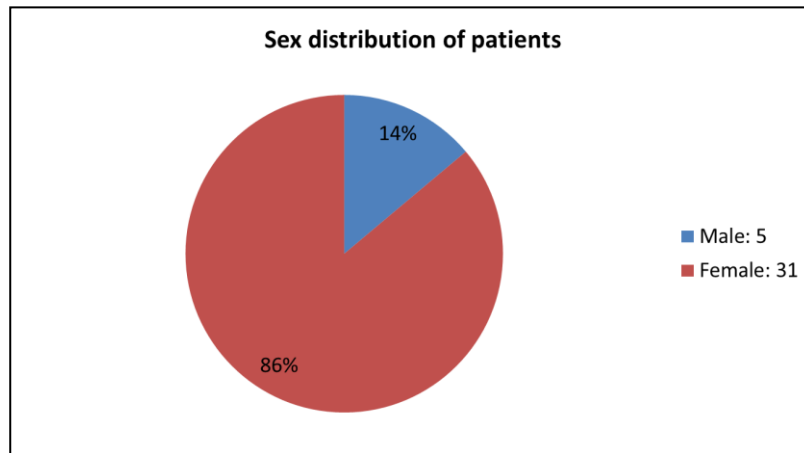
Age wise distribution

Figure 1 showed that the agewise distribution among the 36 patients. Out of 36 patients, 1(2%) patient was under 50 years age, 11(36%) patients from 51-60, 19 (52%) patients were from 61-70 years, 5(13%) patients were above 70 years and 19 (52%) patients were in the 61-70 years group. The youngest patient was 35 years of age, and oldest patient was 81 years of age.



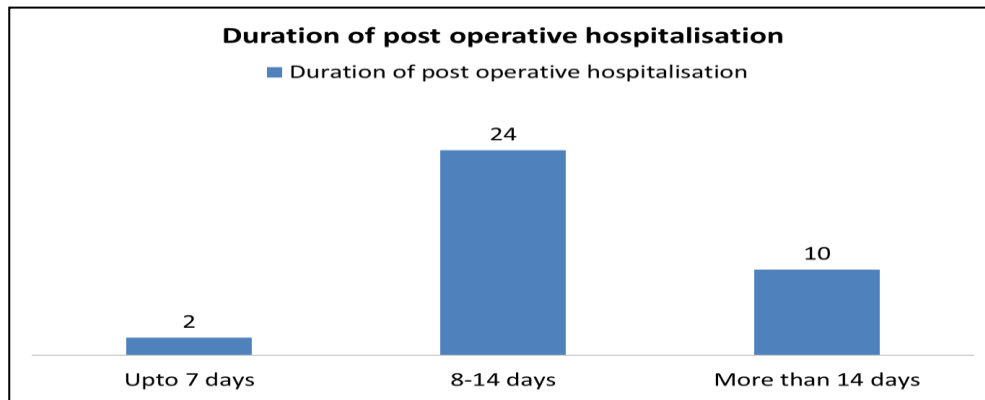
Sex wise distribution

Figure 2 indicated that the sex wise distribution of the 36 patients. Majority of the patients were female 31 out of 36 patients (86%) and 5 out of 36 patients (14%) were male.



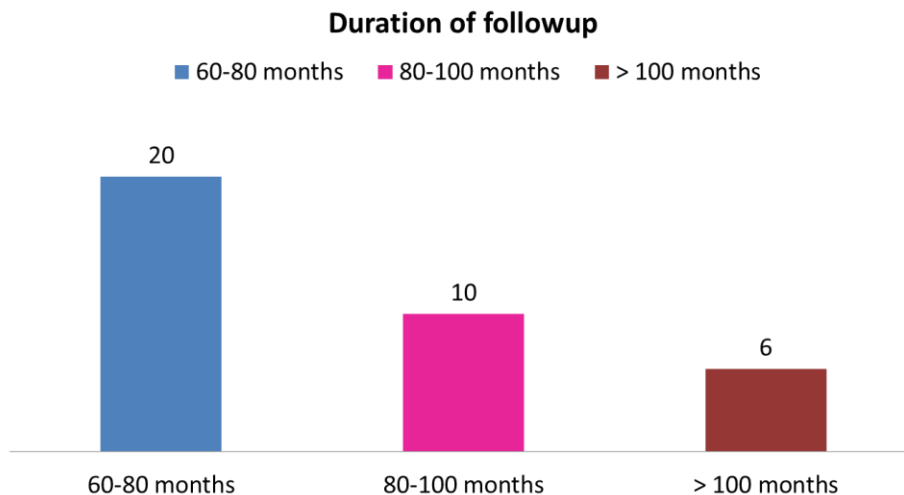
Duration of post operative hospitalization

Figure 3 represented that the duration of post-operative hospitalization. 24 out of 36 patients (66%) were discharged on the 14th post op day, 2 out of 36 patients (5%) were discharged before 14 days, 10 out of 36 patients (27%) were discharged after 14 days due to various reasons like erythema and redness around operative site, medical comorbidity, ICU stay, and ambulation. One patient had 23 days of post op stay due to hypotension and tachycardia, for which he was shifted to surgical ICU for monitoring.



Duration of follow-up

Figure 4 showed that the follow duration in months. Minimum follow up duration is 60 months (5 years) and the maximum is 156 months (13 years). 20 out of 36 patients (55%) follow up were 60-80 months and only 6 out of 36 patients (16%) were follow up >100 months.



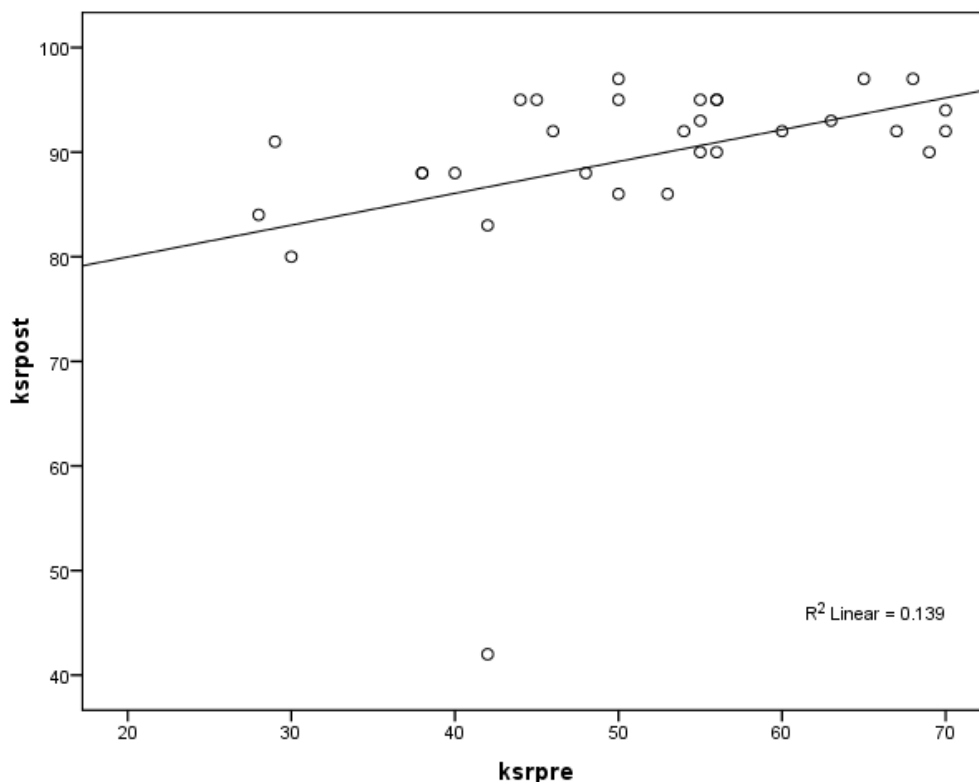
Correlation between duration of follow up with knee society score

Table.1. indicated that the correlation between duration of follow up with knee society score for right and left sides, and with functional knee scores.

Duration of follow up		KSS right side	KSS Left side	Functional Score
Spearman	Correlation coefficient	.004	0.225	-0.146
	Significant	0.984	0.216	0.394

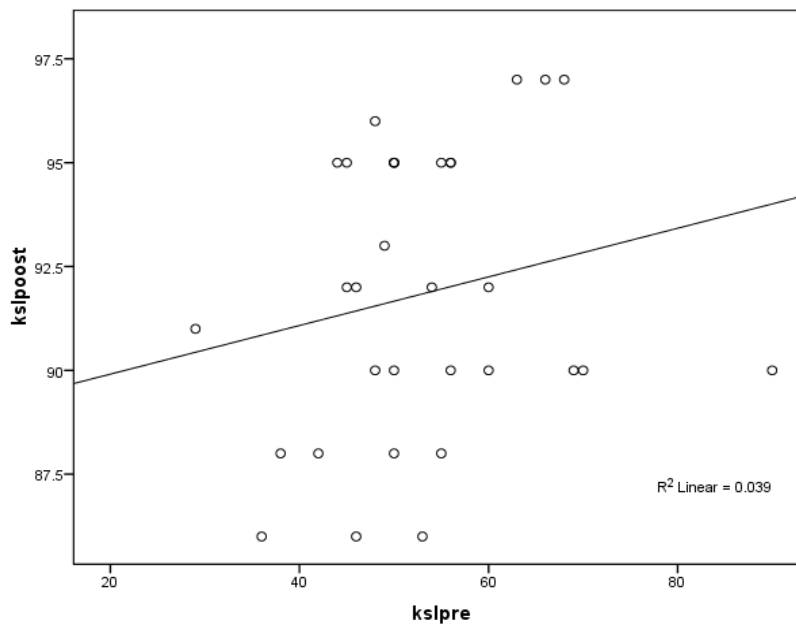
Pre op vs post op knee society score- Right TKR

Figure. 5. Shows correlation between knee society score pre op vs post op for right TKR. Mean pre op score is 51.35, and mean post op score is 89.52. There is significant improvement in the score post operatively compared to pre op. P value is < 0.001, which is highly significant.



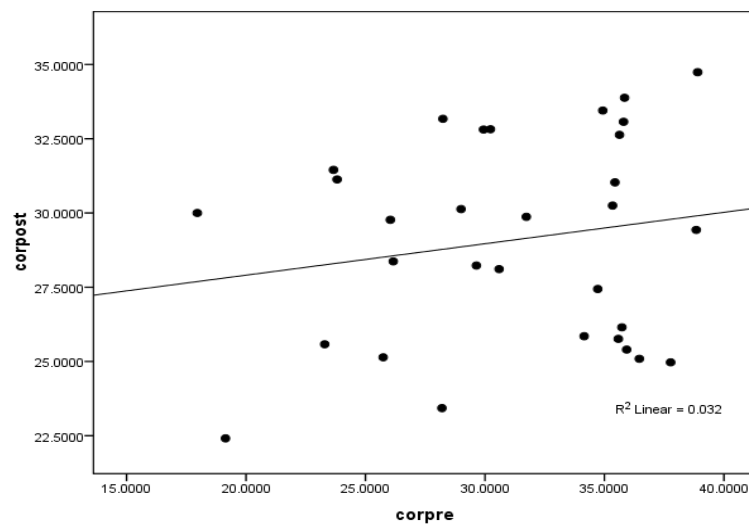
Pre op vs post op knee society score- Left TKR

Figure. 6 shows that the correlation between American knee society score pre op vs post op knee society scores for left TKR. Mean pre op score is 53.30, and mean post op score is 91.84. There is significant improvement in the score post operatively compared to pre op. P value is < 0.001, which is highly significant.



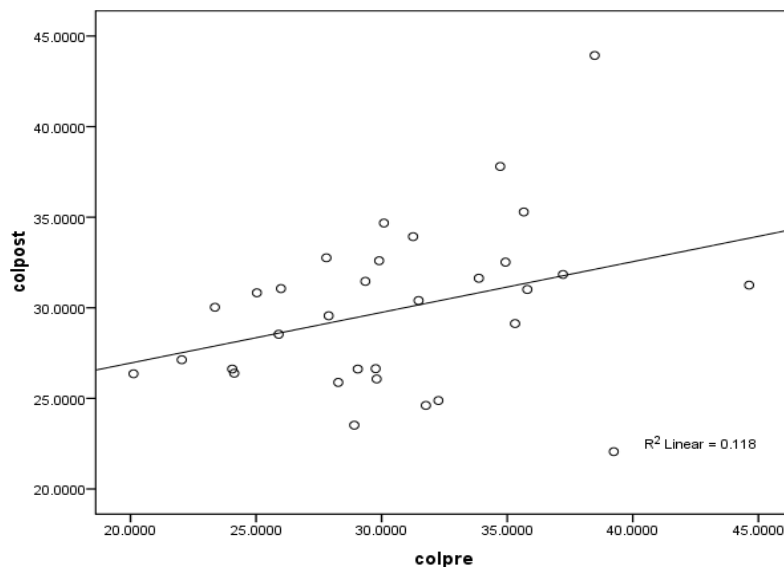
Pre op vs Post op posterior condyle offset- Right TKR

Figure. 7. represents that the correlation between right posterior condyle offset pre op and post op. It shows significant correlation between pre op and post op posterior condyle offset ($P < 0.001$).



Pre op vs Post op posterior condyle offset- Left TKR

Figure. 8. indicates that the correlation between left posterior condyle offset pre op and post op. It shows significant correlation between pre op and post op posterior condyle offset ($P < 0.001$).



4. Discussion

Demographic details

36 patients (63 Knees) followed up out of 150 patients (225 knees) from 2001 to August 2009, who underwent total knee replacement with mobile bearing (LCS). Our study follow-up is approximately 24%. In the study done by Vogt et al. 39 out of 101 patients (38%) were followed up at 10 years [9]. Another study was done by Maniar et al where 37 patients out of 45 patients (80%) were followed-up at 10 years [10]. Most of the patients underwent bilateral total knee replacement and 9 underwent unilateral knee replacement (left = 6 and right = 3). The low percentage of follow up in our study probably because 15 out of 150 patients (10%) are currently elderly (>80 years) and 5 out of 150 patients (3%) are foreign patients. It is a significant finding to note that 100 out of 150 patients (66%), 165 out of 225 knees (73%) are from West Bengal, Bihar, Delhi, Jharkhand and Orissa with a distance ranging approximately from 1800 kms to 2500 kms from Vellore. This long distance would have made it difficult for patients to come back for follow up.

Average duration of follow up of patients was 80.2 months. Minimum follow up was 60 months and maximum was 156 months. The mean age of patients was 62.71 years. Youngest patient was 35 years old and the oldest was 81 years old. In our study 30 out of 36 patients (83%) underwent total knee replacement for osteoarthritis and 6 out of 36 patients (17%) underwent TKR for rheumatoid arthritis. Vogt et al reported that 113 out of 126 (90%) had presented with osteoarthritis and 13 out of 126 patients (10%) were with rheumatoid arthritis (44). Maniar et al reported that 30 patients out of 35 patients (85%) presented with osteoarthritis and rest 5 patients (15%) presented with rheumatoid arthritis (8). In our study 31 out of 36 patients (86%) were women and 5 out of 36 patients (14%) were men. Vogt et al study had 76 out of 101 patients (75%) women and rest 25 (25%) were men.

Knee Society Scores

In our study there was considerable improvement in the American Knee Society Score post operatively as compared to calculation done pre operatively. The average pre-operative score was 51.35 for right TKR and 53.3 for left TKR. The average post-operative score was 89.52 for right TKR and 91.84 for left TKR. There was a significant improvement in the knee society score after TKR. Pain, range of motion, and stability were taken into consideration for assessing the Knee Society Score after TKR, and was found to show a significant improvement in score. ($p=0.000$). Sanchez-Sotelo et al found that in their study of 101 patients following knee replacement, the average post operative Knee Society Score was 78. Vogt et al followed up 36 patients who underwent mobile bearing TKR for a mean of 11.4 years, wherein they found that the average post operative Knee Society Score was found to be 78 [9]. Trieb et al in their follow up of patients who underwent TKR for rheumatoid arthritis for a mean of 11.2 years, found that the average Knee Society Score was 77.2 [11]. Maniar et al in their study of mid term results of 45 patients who underwent TKR done with LCS implant in the Indian scenario, found that mean pre op Knee Society Score was 33, which improved to 91 postoperatively [10]. This is comparable to our results. Our study average pre-operative score was 51.35 for right TKR and 53.3 for left TKR. The average post-operative score was 89.52 for right TKR and 91.84 for left TKR.

Functional Scores

In our study there was improvement in the functional knee score post operatively. The average pre op functional score was 35.85, and average post op score was found to be 95.14 showing very significant improvement. Mobilisation of the patient and use of ambulatory aids were taken into consideration in assessing the scores. There was considerable improvement in the scores after TKR. ($P=0.000$). Sanchez- Sotelo et al studied results of 101 low contact stress TKR [12]. They found that post operative average functional knee score was 93, which is comparable with our results. Vogt et al in their follow up of patients who had undergone TKR found that the average post operative functional score was 66 [9]. Sharma et al in their study of surgeries for patients who underwent TKR for rheumatoid arthritis found that the mean clinical and functional scores were 90 and 59 [13]. Trieb et al in their follow up of patients, who underwent TKR for rheumatoid arthritis for a mean of 11.2 years, found that the average functional score was 75.3 [11]. Maniar et al in their study of mid term results of 45 patients who underwent TKR done with LCS implant in the Indian scenario, found that mean pre op functional score of 45, which improved to 76, postoperatively [10].

Posterior Condyle Offset

In our study shows the average posterior condyle offset pre operatively for the right and left sides were 29.08 and 29.90 respectively. The average offset post operatively was found to be 30.56 and 31.11 respectively for right and left TKR. There was significant increases post operatively as compared to pre op, ($P<.001$ for right side, and $p<.001$ for left side) but no correlation between posterior condyle offset and knee range of movement or knee society score was found.

Ishii et al studied correlation of post operative posterior condyle offset medially and laterally though CT scan imaging and correlated it with x-ray findings, and found no significant correlation. In their study, the pre op mean posterior condyle offset was 29.9 and post op it was a mean of 30.0 [14]. Kim et al studied 45 TKR surgeries in 35 patients, to determine the effect of the posterior condyle offset on maximum flexion at the knee in PCL sacrificing TKR, and found that there was a significant relation between them. Their mean pre op posterior condyle offset was 24.78, and mean post op value was 28.11. They found no significant relation between posterior condyle offset and the maximum flexion angle at the knee [15]. Geijsen et al study shows that increase or decrease in posterior condylar offset had no significant influence on range of movement or knee society score [16]. Bauer t et al study shows that no correlation was found between the posterior condylar offset and the postoperative knee flexion [17].

5. Conclusion

In the present study we conclude that there was significant increases of pre op posterior condyle offset and post op posterior condyle offset. Posterior condyle offset pre op and post op show significant correlation. In our study, there was no instance of loosening, instability. This is probably since the follow up is only 50-60 months. This is very helpful for the total knee replacement patients.

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