

Prospective Study of Clinical and Functional Outcome of Total Knee Replacement in Osteoarthritic Knee.

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Abstract

Background: Total knee arthroplasty (TKA) is presently a dependable treatment modality for osteoarthritis. The purpose of this study was to explore the clinical and functional outcome of total knee arthroplasty using knee society score, WOMAC Score, Oxford knee score and SF-36 Questionnaire and to correlate between functional score and clinical score.

Methods: 42 cases of knee osteoarthritis who underwent primary total knee arthroplasty at a tertiary care centre at Bharatpur over a period of two years were surveyed clinically and functionally using various knee scoring systems.

Results: There was significant increase in SF -36 SCORE, walking, stair climbing capacity and quality of life during follow up at 3, 6 and 12 months interval. Significant improvement was noted in the mean preoperative Oxford clinical score (OCS) of 19.86 ± 2.49 versus postoperative score of 42.38 ± 1.58 at the end of 6 month. Similarly the mean preoperative knee functional score (KFS) was 55.86 ± 2.25 which increased to a postoperative score of 77.00 ± 1.67 at the end of 6 month. Likewise the mean pre-operative WOMAC Score improved from 93.50 ± 3.13 to a post-operative score of 49.50 ± 2.82 . Statistical significant association was observed between knee functional score and Oxford clinical score at every follow up visit.

Conclusions: For the better improvement in the functional ability of the patient total knee arthroplasty is the only reliable treatment method that can return back the patient to pre-disease state. TKR is a solid method for an OA knee patient to have a pain free stable mobile joint, as evident by the improvement in the post-op knee clinical score and knee functional score.

Introduction

Primary knee osteoarthritis (OA) is the commonest articular disease in the older population.¹ It is a pandemic disease of global importance which leads to disability and negatively affects the daily activities of patients.² The disease is progressive and leads to angular deformity, recurrent swelling, stiffness, and pain.³ Thus it is a leading cause of physical and functional disability and socioeconomic burden to the patient, family members, and community.⁴ Total knee replacement (TKR) operation is a well-established and proven procedure to decrease pain and improve function in patients with debilitating pain due to end-stage arthritis of the knee joint.⁵ TKR is a gold standard surgical therapy of end stage OA of the knee with failed non operative treatment. The evaluation of knee work, pathology and its suggestion on a patient's quality of life is exceptionally critical to supply an objective assessment of treatment modalities for clinical and investigative contexts.⁶ There are numerous assessment tools or scoring systems with varying sensitivity and validity. The Oxford score, 36-Item Short Form Survey (SF-36) questionnaire, Knee Society Score (KSS) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) Scoring frameworks have been commonly utilized and these have been

formally approved in a multi-centered trial study using standard psychometric strategies and considered favorable assessment tools pre- and post- TKR.^{7,8}

Objective Of The Study

The general objective of the study was to examine the early clinical and functional outcome of primary total knee replacement in patients with primary knee osteoarthritis using various standard scoring systems to eliminate the bias of single scoring. The specific objective was to assess pre-operative and post-operative WOMAC score, knee society score, and SF-36 questionnaire at 3, 6, and 12 months follow up.

Material And Methods

This was a prospective, observational study of 42 subjects with 62 consecutive knees with in osteoarthritis of the knee (Kellgren and Lawrence grading 3 and 4) who underwent either unilateral or bilateral Total knee replacement from August 2018 to June 2020 (over 23 months) at the government hospital.

Inclusion criteria:

- Both male and female patients of age between 50 to 85 years with disabling knee pain due to osteoarthritis.
- Failure of non-operative treatment

Exclusion criteria:

- History of recent or past septic arthritis in the same knee.
- Valgus knee
- Knee with loss of extensor mechanism
- Revision TKR
- Uncontrolled diabetes
- Patients with neurological deficit in ipsilateral lower limb

All patients above 50 years presented to our outpatient department (O.P.D.) at government hospital with knee pain were evaluated clinically and radiologically and selected for operation based on the failure of conservative treatment in end-stage arthritis. The Institutional Review Board (IRB) on human subjects'

research and ethics committee of the Bharatpur Hospital, Bharatpur, Chitwan, Nepal approved our study protocol. Written informed consent was obtained from all recruited patients. The study was performed in accordance with the [Declaration of Helsinki](#). The demographic, clinical data, and knee society score, Oxford and WOMAC and SF-36 were noted at the time of admission. The patients have either undergone a single setting bilateral or unilateral total knee arthroplasty.

Operative Procedure

A pneumatic tourniquet was utilized, and a medial parapatellar arthrotomy approach was used. All patients were treated by posterior cruciate sacrificing TKR. In all subjects, femoral preparation was performed first, followed by tibial preparation. All implants were cemented after the use of pulse lavage, drying, and pressurization of the cement. Patella was not replaced and only patelloplasty with denervation of patella was done. The drain was used in all patients and was removed after 2 days.

Postoperatively patients were given intravenous antibiotics for 5 days. Post-operative pain was managed by intravenous opioids, paracetamol (oral and intravenous), and epidural top-ups for 24 hours. Low molecular weight heparin (LMWH) injection was started from the next day, six hours after removal of epidural injection and continued for next five days and patients started ambulation from 1st post-operative day. They stayed in the hospital for an average period of 8-10 days and continued physiotherapy as per our protocol at home. All patients received identical surgical protocol and post-operative care.

Sutures were removed at 2 weeks and a follow-up assessment was recorded at 3 months, 6 months and 12 months.

Patients were assessed clinically for function, range of motion of knee joints, the status of pain, change in daily routine activity, and generalized well-being after TKR. KSS, Oxford, WOMAC score and SF-36 questionnaire were calculated at all follow-up visits and radiological assessment was done.

Statistical analysis

All the demographic and clinical data were collected and entered into an excel master chart. Statistical analysis was done using Statistical Package for Social Science (SPSS) version 20. Categorical data were expressed as frequency, percentages, and continuous data were analyzed using mean and standard deviation. Duncan's multiple range test was used for post hoc comparison, p-value < 0.05 was considered to be statistically significant.

Observations And Results

Total of 45 patients with 66 knees were included in the study. Two unilateral who lost to follow up and one bilateral knee who died after 7 months were excluded from the study. So, final analysis was done for

42 patients (20 bilateral and 22 unilateral TKR). The mean age of the patients was 63.33 ± 8.21 years (range 50-84 years). There were 28 males (11 unilateral and 17 bilateral TKR) and 14 female patients (11 unilateral and 3 bilateral TKR). Mean duration of surgery was 56.83 ± 7.26 min (for unilateral TKR) and 90.43 ± 8.26 min (for bilateral TKR). Mean duration of hospital stay was 12.13 ± 1.12 days.

33 patients (78.6%) were overweight with 6 patients having grade one obesity (14.3%) (Table 1).

Table 1

Showing number of patients in each category as per BMI.

BMI	Frequency
18.5 - 24.9 (Normal)	7.1%(3)
25 - 29.9 (Overweight)	78.6%(33)
30 - 34.99 (Grade I Obese)	14.3%(6)
35 - 39.99 (Grade II Obese)	0
>40 (Morbid Obese)	0
Total	100.0%(42)
BMI: Body mass index.	

Medical co-morbidities seen in our study group were hypertension, diabetes mellitus, coronary artery disease, hypothyroidism and chronic obstructive airway disease, which did not compromise the patient's ability to withstand anesthesia, the metabolic demands of surgery and wound healing, and the significant rehabilitation necessary to ensure a favorable functional outcome.

There was gradual increasing range of motion was seen during subsequent follow-ups. Mean range of motion at pre op was $58.48^0 \pm 6.24^0$ which improved to $86.07^0 \pm 2.83^0$ at 3 months, $97.95^0 \pm 1.96^0$ at the end of 6 months and $103.86^0 \pm 4.06^0$ at final follow up at 12 months (Table 2 and Figure 1).

Table 2

Showing trends in ROM with statistical relation

		Pre op	3 month	6 month	12 month
Overall ROM	Mean	58.48 ^b	86.07 ^a	97.95 ^b	103.86 ^c
n = 42	Std. Deviation	6.24	2.83	1.96	4.06
Values with different superscripts are statistically significant (p<0.05)					

Oxford knee score, WOMAC Score, SF-36, and Knee Society Score were used to assess clinical and functional status of the patients.

Table 3

Showing changes in Pain score, KSS and Functional score with time.

	Pre op	3 month	6 month	12 month
WOMAC score	93.50 ^a (±3.13)	69.40 ^b (±3.18)	49.50 ^c (±2.82)	44.48 ^d (±1.98)
Oxford score	19.86 (±2.49)	35.45 (±2.28)	42.38 (±1.58)	44.57 (±1.02)
KSS	55.86 ^a (±2.25)	67.31 ^b (±2.02)	77.00 ^c (±1.67)	89.48 ^d (±2.46)
SF 36 score	23.38 ^a (±1.85)	54.98 ^b (±2.97)	76.05 ^c (±1.89)	90.48 ^d (±2.23)
Values with different superscripts are statistically significant (p<0.05)				

KSS: Knee society score; WOMAC score: Western Ontario and McMaster Universities Arthritis Index score; Pre op: Pre-operative, SF 36 score: 36-Item Short Form Survey

Mean pain score improved significantly at each follow up till the end of twelve months.

Preoperative Knee Society Score, Oxford Knee score, SF-36 Questionnaire was compared with Knee Society Score at 3 months, 6 months and one year. Mean pre-operative scores improved significantly at each follow up till the end of first year.

Functional score of every subject was noted at pre-operative visit as well as every follow up visit. Average gain as compared to pre-operative functional score was assessed (Table 3 and Figure 2).

There was significant improvement in correction of varus deformity of knee with mean varus deformity of $17.24^0 \pm 3.29^0$ before surgery to $5.90^0 \pm 1.59^0$ immediately after surgery on radiographic evaluation.

Stair climbing capacity also markedly improved with mean score of 12.38 ± 1.56 as compared to the pre-operative score of 2.74 ± 2.52 .

There was significant improvement in walking capacity in post-operative knee with mean score of 27.29 ± 1.27 from pre-operative walking status of 6.79 ± 2.43 . There were big differences in quality of life between pre-operative and post-surgical status of patients (p<0.05).

Table 4

Post-op complications.

Complications	Frequency
Stiffness	11.90% (5)
Anterior knee pain	4.76% (2)
Delayed wound healing	11.90% (5)
Infection	2.38% (1)
CRPS	9.52% (4)
CRPS: complex regional pain syndrome	

Post-operative knee stiffness was seen in 5 knees. Pre-operative range of motion in these patients was 0–56⁰, 0-62⁰, 0-64⁰, 0-60⁰ and 0-50⁰. They underwent manipulation under anesthesia 3 months after surgery. This was followed by an intensive physiotherapy program. They gained range of motion like rest of the patients after rehabilitation program.

Two patients complained anterior knee pain till 3 months after surgery. But they became asymptomatic without any intervention at 6 months follow up.

Delayed wound healing was noted in five patients with minimal sloughing of margins. These complications were found in diabetes mellitus with 1 or 2 other co-morbid patients. All wounds were healed by intermittent dressing under aseptic environment over a period of three weeks. During this research period 3 patients developed superficial infection at 6 - 8 months after surgery which required debridement and resolved. (Table 4).

Discussion

Total knee arthroplasty is an effective procedure and is associated with substantial functional improvement. All patients who were having difficulty in mobilizing because of osteoarthritis found good relief after total knee arthroplasty.

The mean age of patients in our study was 63.33 ± 8.21 years (range 50 to 84 years) which is lower than Gary Hooper et al¹⁰ and Ackerman IN et al¹¹ study but similar to study done by Bhole CV et al¹². The most prevalent age to develop osteoarthritis of the knee was above 50 years. The most frequently affected joint was the knee. Early development of severe osteoarthritis changes among the Nepali population in this study may be because of squatting, cross leg sitting and hill climbing inhabit which is supported by a study done by Bhole CV et al¹² and Haque MM et al¹³. In this study, 92.9 % of patients were overweight to obese. They achieved an excellent outcome as measured by KSS. Paul Baker et al¹⁴ and Andy Judge et al¹⁵ had similar results. In our study, 52% of total patients who were overweight to obese undergone bilateral TKR where no complication was seen till the end of the last follow-up visit. Benjamin James et al¹⁶ and Vandana Ayyar et al¹⁷ stated that there is a similar benefit from replacement surgery irrespective of BMI.

The posterior cruciate substituting design was found to be superior among the various implant designs available for the knee replacement surgery till the date⁸. Our study showed similar improvement in mobility as found by CBuz Swanik study. In his study patients were able to replicate remarkable degree of range of movement and position of joint. No significant differences were noted in joint proprioception and balance among the patients who were treated with retention of the posterior cruciate ligament.⁹

The range of motion of every subject was noted at the pre-op visit as well as every follow visit so that average gain compared to the pre-op range of motion could be assessed. There was a gradual increasing range of motion was seen during subsequent follow-ups. The final mean range of motion was comparable to other posterior stabilized TKR designs as shown by Wilco C H Jacobs et al¹⁸ (mean 113⁰), Frank R. Kolisek et al¹⁹ (mean 118⁰), and by K. H. Sancheti et al²⁰ (128⁰±8.32⁰). The current study showed satisfactory functional and clinical results in the majority of patients with an acceptable limit of complications.

Two patients experienced anterior knee pain until 3 months after surgery. These symptoms resolved at 6 months follow-up without any intervention. Schurman DJ et al²¹ report similar incidence of anterior knee pain to be 5 - 10%, Itokazu M et al²² reported 8% and Schai PA et al²³ reported 20.2% cases with post-operative anterior knee pain. The majority of these patients settled with conservative measures¹⁸. K. H. Sancheti et al²⁰ showed that they had 7 patients with anterior knee pain out of 160 TKRs (4 unresurfaced and 3 resurfaced). None of them needed intervention.

The mean Knee Society Score and SF-36 Questionnaire improved significantly from 55.86(±2.25) to 67.31(±2.02) at 3 months, to 77.00(±1.67) at 6 months and 89.48(±2.46) at 1 year. Final KSS, SF-36 in the study was comparable to H. Farahini et al²⁴ who in their study showed that pre-operative KSS improved from 45.2+12.10 to 93.7+2.8. K. H. Sancheti et al²⁰ and Young-Joon Choi et al²⁵ reported improvement in KSS from 40.1+10.7 to 90.3+5.34.

There was significant improvement in correction of varus deformity with a mean of 17.24⁰ ± 3.29⁰ before surgery to 5.90⁰ ± 1.59⁰ degrees post TKR and stair climbing capacity with a mean score of 12.38 ± 1.56 as compared to the pre-operative score of 2.74 ± 2.52.

There was a significant improvement in walking capacity in the post-op knee with a mean score of 27.29 ± 1.27 from the pre-op walking status score of 6.79 ± 2.43.

There were big differences in the quality of life between the pre-operative and post-surgical status of patients (p<0.05). In their respective studies conducted by Hilding et al²⁶, and Mandeville D et al²⁷, after total knee replacement, they have mentioned that due to overall correction in frontal knee angle, varus deformity and relaxation in stretched and contracted capsulo-ligamentous structure, there was progression in walking standing and stair climbing capacity in all patients.

The mean duration of hospital stay was 12.13±1.12 days which was comparable with other studies. H Farahani et al²⁴ reported a mean hospital stay of 6.1 days which is inconsistent with present study results. Most of our patients were illiterate coming from a remote areas. Hence our government hospital made a protocol of discharge of such patients only after gait training, physiotherapy training, and suture removal.

Limitation of the study

This is a single-center study and lacks a comparison group. The sample size is small and the follow-up period is relatively short.

Conclusion

Treatment with total knee arthroplasty provides greater pain relief and functional improvement within few months as reflected by the improvement in the post-operative knee clinical score and functional score. The result of this study may help to counsel patients to undergo total knee replacement in indicated cases in the under-developed country with low socioeconomic status for long-term benefit and cost-effectiveness.

Declarations

The Researchers' Level of the Participation

All authors fully and actively participated in this study and manuscript writing.

Source of funding:

self-funding

Conflict of interest:

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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Figures

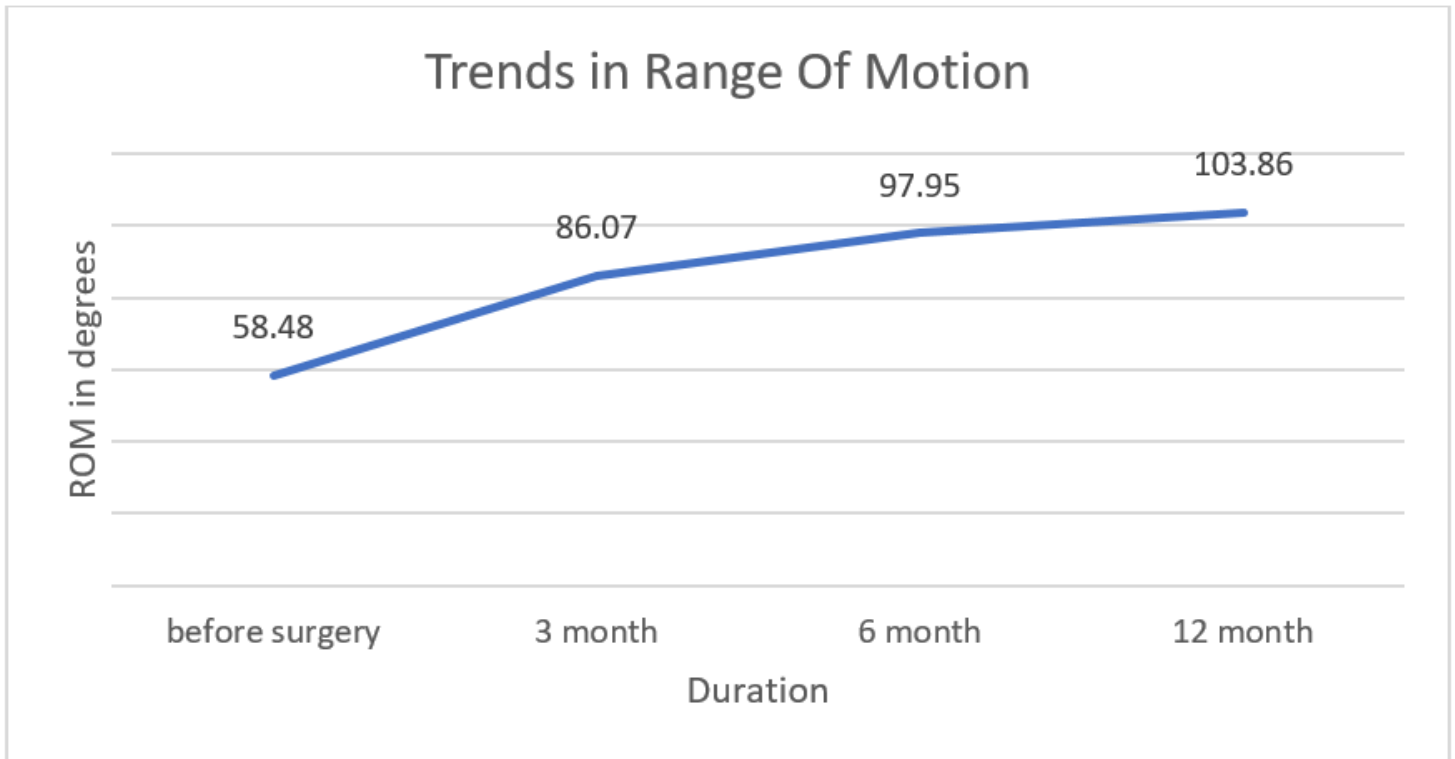


Figure 1

Graphical representation of trends in the ROM.

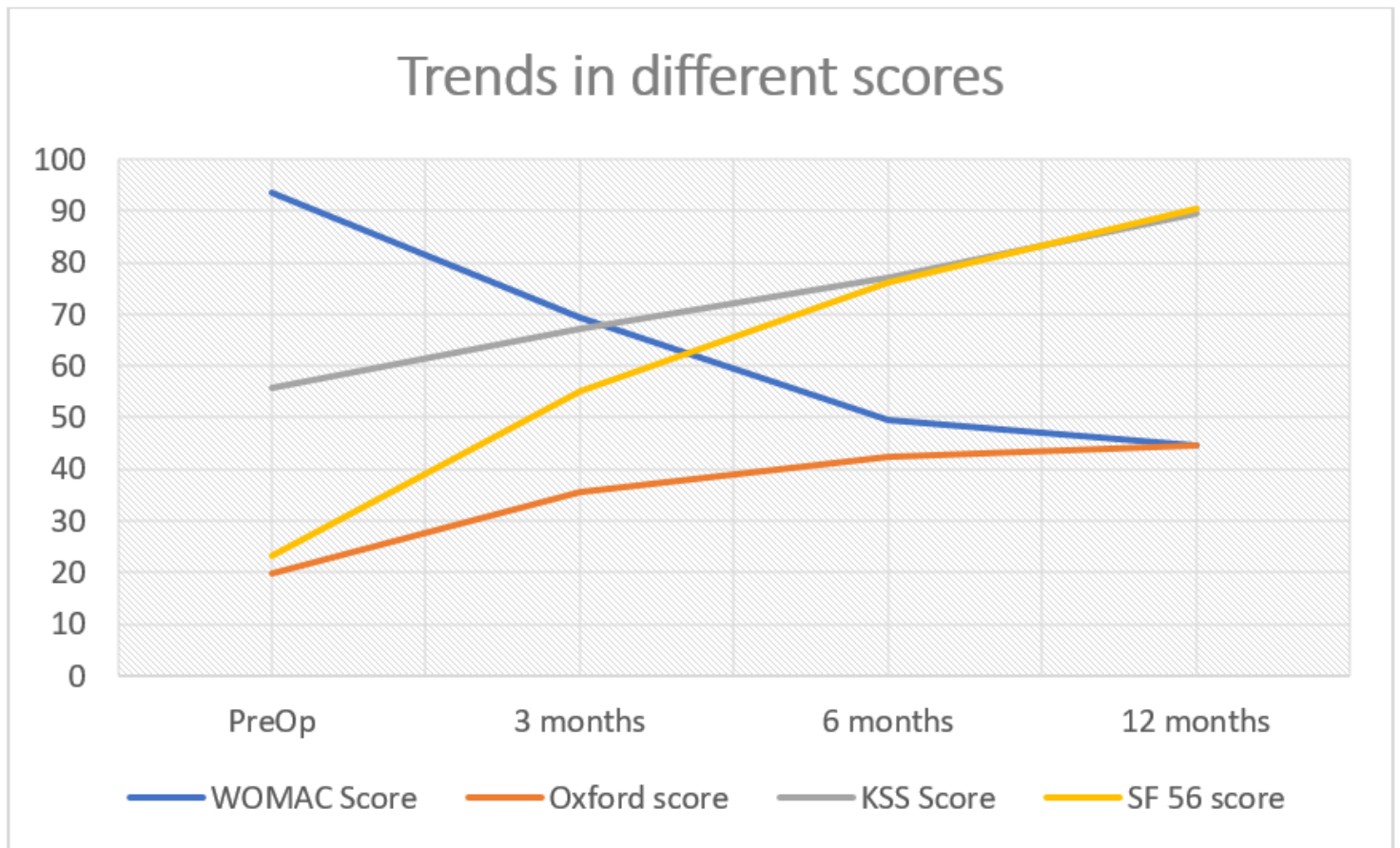


Figure 2

Representation of changes in WOMAC score, KSS, Oxford score and Functional Score from pre-operative to end of twelve months.