

FUNCTIONAL OUTCOME OF PATIENTS WITH MODERATE-TO-SEVERE OSTEOARTHRITIS TREATED BY TOTAL KNEE ARTHROPLASTY AT A TERTIARY CARE CENTER

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ABSTRACT

Objectives: Osteoarthritis (OA) is one of the common causes of significant morbidity in elderly individuals. It typically manifests as painful joints affecting mobility in individuals particularly women in and after fifth or sixth decade of life. While most of the mild-to-moderate cases are managed conservatively, in severe OA total knee arthroplasty (TKA) is being increasingly done with good functional outcome. The aim of the study was to assess functional outcome in case knee OA cases treated by TKA. The study aimed to study the complication in patients undergoing TKA.

Methods: Forty patients with moderate-to-severe knee OA and treated by TKA were included in this study on the basis of a predefined inclusion and exclusion criteria. Demographic details such as gender and age were noted in all the cases. Body mass index (BMI) was determined. All patients were treated by TKA. Functional outcome was assessed by Japanese Orthopaedic Association score (JOA) as well as Functional knee clinical score (KCS). Incidence of complications was assessed during follow-up. For statistical purposes, $p < 0.05$ was taken as significant.

Results: There were 25 (62.50%) females and 15 (37.50%) males with a M: F ratio of 1:1.66. 13 (32.50%) patients were obese (BMI ≥ 30) and 16 (40.00%) patients were overweight (BMI ≥ 25 but < 30). A total of 11 (27.50%) patients had BMI < 25 . The mean KCS as well as JOA scores at the time of final follow-up were found to be significantly improved as compared to KCS and JOA scores at the time of presentation and the difference was found to be statistically highly significant ($p < 0.05$). There was a significant reduction in pain as assessed by VAS score. Total 6 (15%) patients developed complication which could be managed conservatively.

Conclusion: TKA in patients with moderate-to-severe OA treated by TKA is associated with significant improvement in functional outcome and acceptable complication rate.

Keywords: Osteoarthritis knee, Arthroplasty, Functional outcome, Complications.

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INTRODUCTION

Osteoarthritis (OA) is one of the common causes of significant morbidity in elderly individuals. It typically manifests as painful joints affecting mobility in individuals particularly women in and after fifth or sixth decade of life [1]. Women are predominantly affected because of increased incidence of osteoporosis in post-menopausal age. Knee joint is one of the commonly affected joints in cases of OA because of loading that takes place during walking. The basic pathology in cases of OA of knee joint predominantly consists of degenerative process accompanied by inflammatory components causing damage to articular cartilage of the knee joint [2].

The symptoms of knee OA may vary from mild pain causing discomfort to severe pain causing severe affection of mobility. In addition to pain OA may also present as decreased range of motion. The pain progress over a period of years may be responsible for decreased mobility of the affected individual with the consequences such as weight gain. In initial stages, the pain may begin after considerable exertion and may respond to simple rest and in some cases to non-steroidal anti-inflammatory drugs. However, in later stages, even the rest pain may be present and the pain may not respond to usual doses of NSAIDs [3].

The diagnosis of OA knee can be made on the basis of typical history of pain exacerbated by exertion and clinical examination which may show decreased range of motion. The diagnosis is usually confirmed on the basis of imaging. Plain radiograph of the affected knee joint may show asymmetric reduction in the joint space (medial more affected as compared to lateral compartment). In mild cases, weight bearing radiographs are recommended which may show joint space

narrowing better than non-weight bearing X-rays. In addition to joint space, narrowing other features on X-ray include subchondral sclerosis, osteophytes, and subchondral cysts. In selected cases and cases in whom operative interventions are contemplated, further imaging such as computed tomography or magnetic resonance imaging can be done [4].

Management of knee OA depends on severity of pain as well as grading of OA on the basis of imaging. In initial stages, OA knee may not require anything more than rest, physiotherapy, and NSAID. In cases having moderate pain, alternative methods such as intra-articular injections of steroid and platelet rich plasma can be given. In severe cases, having intractable pain or unacceptable limitation of mobility surgical interventions such as arthroscopic removal of loose bodies or arthroscopic repair of meniscal tear and osteotomy can be done. Proximal fibular osteotomy as well as high tibial osteotomy is common osteotomy surgeries done in cases not responding to non-surgical management [5].

However, in many cases not responding to these measures, total knee arthroplasty (TKA) is the only treatment which may reduce pain, improve mobility, and significantly improve quality of life of patients with severe OA. TKA consists of reconstruction of affected knee joint by removal of affected bones and cementing an appropriate prosthesis. TKA done by expert surgeons is known to have excellent functional outcome in terms of increased mobility and improved quality of life [6].

We conducted this study to assess the functional outcome of patients with severe OA who failed to respond to non-surgical management.

Aims and objectives

The objectives of the study are as follows:

1. To assess functional outcome in knee OA cases treated by TKA.
2. To study complications in patients undergoing TKA.

METHODS

This was a prospective study conducted in the Department of Orthopaedics of Prakash Institute of Medical Sciences (PIMS) and Research, Urun Islampur Dist Sangli. Forty patients with moderate-to-severe knee OA treated by TKA were included in this study on the basis of a predefined inclusion and exclusion criteria. The study duration was 24 months extending from January 2021 to December 2022. Institutional ethical committee approved the study and written informed consent was obtained from all the participants of the study. In all patients, demographic details such as age and gender were noted. Height, weight, and body mass index (BMI) of all the patients were also noted. A detailed history was taken in all patients in terms of severity of pain, duration since pain started, and effect of pain on mobility. A detailed clinical examination was done in all the cases so as to find out presence of swelling, tenderness, and range of motion. The diagnosis of OA of knee was done on the basis of weight bearing X-rays. In selected cases particularly in patients who were too frail to undergo weight bearing X-rays, computerized tomography or magnetic resonance imaging was done. OA was classified as moderate (moderate multiple osteophytes, definite narrowing of joint space, and some sclerosis and possible deformity of bone ends) or severe (large osteophytes, marked narrowing of joint space, severe sclerosis, and definite deformity of bone ends) on the basis of Kellgren and Lawrence system. The pre-operative functional assessment was done using Knee clinical score (KCS) [7] and Japanese Orthopaedics Association score (JOA) [8]. All patients underwent routine investigations such as complete blood count, coagulation profile, bleeding time, clotting time, Electrocardiogram (ECG), LFT, and KFT. ECG and 2D ECHO were done in all cases.

Operative procedure

All patients were operated under spinal and epidural anesthesia. Patients were given supine position and affected limb was put under tourniquet control. Under all aseptic precaution, scrubbing painting and draping was done. The knee was approached using medial parapatellar retinacular approach. Patella was everted and lateral patellofemoral plica was released followed by removal of anterior cruciate ligament, anterior horns of medial and lateral menisci and osteophytes if any. Distal femoral and tibial cuts were then taken and gap balancing was done. A trial prosthesis was then inserted and patelloplasty was done. Knee range of motion and alignment stability was assessed and if found satisfactory then cocktail injection and joint lavage was given. Final implantation was done with cement. Finally closure was done layer by layer, drain was kept *in situ*, and sterile dressing was applied. Dorsalis pedis artery was palpated to rule out vascular compromise in distal limb. Drain was removed on Day 1. Usual knee range of motion started on D1. Physiotherapy was started and full weight bearing was allowed on D2. Patient was discharged on D4 (Fig. 1).

Follow-up visits were done at 1 month, 2 months, 3 months, and 6 months. Follow-up X-ray was done during each follow-up visit. The functional outcome was assessed using JOA as well as Functional KCS. In addition to functional outcome, range of motion as well as severity of pain (VAS Score) was also assessed during each visit. The other factors which were assessed during follow-up visits included VAS scores and complications.

Sample size was calculated according to previous reference studies, when TKA was done for moderate-to-severe knee OA. The minimum sample size necessary was found to be at least 30 patients as calculated by Open Epi-Version 3 online software, a 10% of difference could be determined between the group at 80% power and 5% significance ($\alpha=0.05$, $\beta=0.80$).

Qualitative data were presented with percentages and quantitative data were represented as mean and standard deviation. Paired t-test

was used to compare the differences in outcome scores. The statistical analysis was done using SPSS 21.0 software and $p<0.05$ was taken as statistically significant.

Inclusion criteria

The following criteria were included in the study:

1. Patients with moderate to severe OA of knee treated by TKA
2. Age above 45 years of age
3. Patients willing to give written informed consent to be part of study
4. ASA Grade I/II patients.

Exclusion criteria

The following criteria were excluded from the study:

1. Patients who refused consent
2. Age below 45 years
3. ASA Grade III and above
4. Patients having comorbid autoimmune conditions affecting joints.

RESULTS

Forty cases of moderate-to-severe OA treated by TKA were included in this study out of which there were 25 (62.50%) females and 15 (37.50%) males with a M: F ratio of 1:1.66 (Fig. 1). A total of 16 (40.7%) participants had right side affected whereas 18 (53.3%) of the participants had left knee OA. 6 (15.00%) patients had bilateral OA changes (Fig. 2).



Fig. 1: AP X-rays showing Clockwise from top left) Significant reduction in joint space, reduced joint space with subchondral sclerosis, Post-TKR implant, Implant *in situ* postoperatively

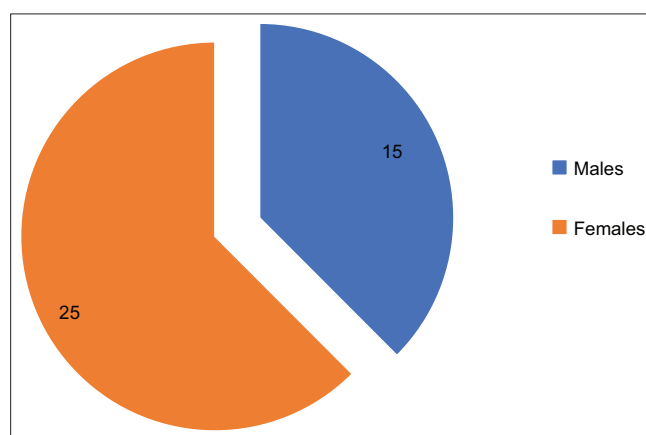


Fig. 2: Gender Distribution of the studied cases.

The analysis of the patients on the basis of age group showed that the most common affected age group was above 65 years (32.50 %) followed by 61–65 years (27.50%) and 51–60 years (17.50%). Only 5 (12.50%) patients were below 51 years of age. The mean age of affected cases was found to be 71.27±9.92 years (Table 1).

Obesity was found to be one of the predisposing factors for development of knee OA. The analysis of BMI in patients showed that among 40 patients, 13 (32.50%) patients were obese (BMI =/>>30) and 16 (40.00 %) patients were overweight (BMI=>25 but <30). A total of 11 (27.50%) patients had BMI <25 (Fig. 3).

At the time of presentation, all patients were having moderate-to-severe pain. The mean VAS score at the time of presentation was 6.82±3.16. The assessment of the pain was done at each follow-up visit. Mean VAS score at 1-month, 2-month, and 3-month follow-up was found to be 4.02±1.96, 3.10±1.32, and 2.36±1.44. At the time of final follow-up, the mean VAS score was found to be 1.21±0.72. The difference in VAS score at the time of presentation and final follow-up was found to be statistically highly significant (p<0.0001) (Table 2).

During each follow-up visit, patients were assessed for functional outcome on the basis of functional KCS and JOA. Mean pre-operative KCS was found to be 38.6±11.18. At the time of final follow-up visit (at 6 months), mean KCS score was found to be 86.24±21.62. Similarly, mean pre-operative JOA score was found to be 48.4±16.8. At the time of final follow-up visit (at 6 months), mean JOA score was found to be 88.42±16.8. The mean KCS as well as JOA scores at the time of final follow-up was found to be significantly improved as compared to KCS and JOA scores at the time of presentation and the difference was found to be statistically highly significant (p<0.05) (Fig. 4).

There were no serious complications such as pulmonary embolism or deep vein thrombosis. Total 6 (15%) patients developed complication. Wound infection and Peroneal nerve palsy were seen in 2 (5%) patients each. Dorsal numbness was seen in 1 (2.5%) patient whereas external hallucis longus weakness was seen in 1 (2.5%) patient. All these complications were treated conservatively. No patient required re-exploration (Fig. 5).

DISCUSSION

We conducted this study of 40 patients with moderate-to-severe arthritis treated by knee arthroplasty. In our study, there was a clear female preponderance with a M: F ratio of 1:1.66. Various studies have reported OA to be more common in females as compared to males. Not only the incidence but also the severity of OA is reported to be more in women as compared to men. Although the exact cause of such a female preponderance is not known various factors such as effect of estrogen as well as body composition and reproductive factors

to be adversely affecting knee joint are proposed to be responsible for increased incidence of OA of knee in women. Muraki *et al.* conducted a large population-based and cohort study to examine the incidence and progression of radiographic knee OA and the incidence of knee pain, and their risk factors [9]. A total of 2262 paired radiographs (74.4% of the original sample) were scored using the Kellgren/Lawrence (K/L) grading system, and the incidence and progression rate of knee OA was examined. The incidence rate of knee pain was also examined. The incident rate of knee pain was 21.2% and 27.3% in men and women, respectively. Female sex was a risk factor for incident K/L Grade ≥2 knee OA, but was not associated with incident K/L Grade ≥3 knee OA or progressive knee OA. Similar female preponderance in cases of knee OA was also reported by the authors such as Bala *et al.* [10] and Andrianakos *et al.* [11].

Most common affected age group was above 65 years (32.50 %) followed by 61–65 years (27.50%) and 51–60 years (17.50%). Only 5 (12.50%)

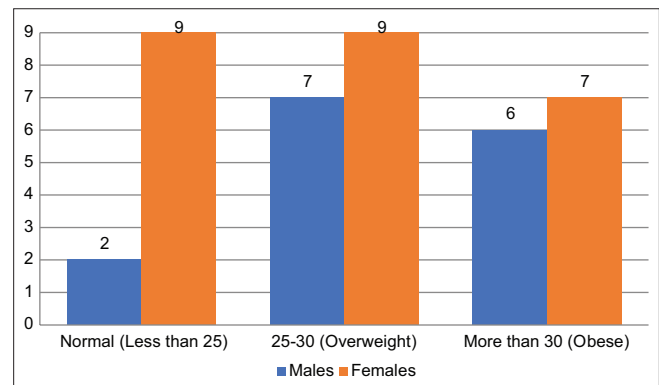


Fig. 3: Body mass index in studied cases

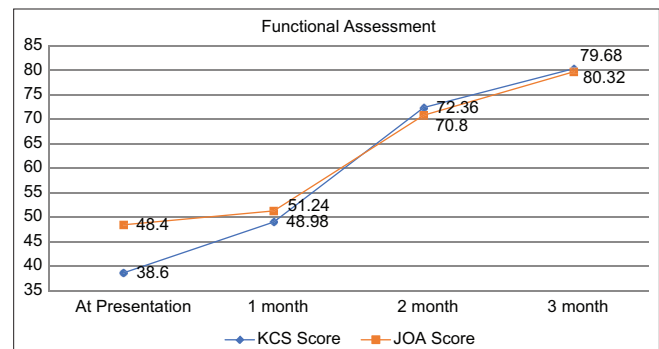


Fig. 4: Functional outcome of cases as determined by KCS and JOA Score

Table 1: Age distribution of the studied cases

Age	No of cases	Percentage
45–50 years	5	12.50
51–60 years	7	17.50
61–65 years	11	27.50
66 years and above	17	42.50
Total	40	100.00
Mean Age	68.74±11.92 years	

Table 2: Mean VAS score of the cases at presentation and during follow-up

Mean VAS Score	Mean±SD	p-value
At Presentation	6.82±3.16	p<0.0001
At 1 month	4.02±1.96	(Paired t-test)
At 2 months	3.10±1.32	Highly significant
At 3 months	2.36±1.44	
Final follow-up (6 months)	1.21±0.72	

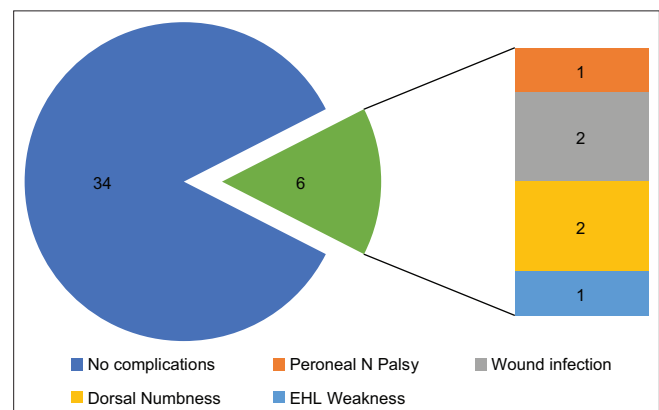


Fig. 5: Complications in studied cases

patients were below 51 years of age. The mean age of affected cases was found to be 71.27±9.92 years. With increasing life expectancy, there is increasing number of elderly individuals and with increasing age, there is a natural effect of wear and tear on every joint and cartilage. Knee joints are affected more commonly because of its load bearing nature. Increasing age and obesity are the common factors seen in individuals affected with knee OA. Most of the patients are affected by OA in 5th or 6th decade of life. Losina *et al.* conducted a study to estimate the incidence and lifetime risk of diagnosed symptomatic knee OA and the age at diagnosis of knee OA [12]. For this purpose, the authors estimated the incidence of diagnosed symptomatic knee OA by combining data on age-, sex-, and obesity-specific prevalence with disease duration estimates derived from the OA Policy Model, a validated computer simulation model of knee OA. The study found that the estimated median age at knee OA diagnosis was 55 years. The estimated lifetime risk was 13.83%, ranging from 9.60% for non-obese men to 23.87% in obese women. Similar mean age was also reported by the authors such as Heidari [13] and Zhang *et al.* [14].

The analysis of BMI in patients showed that among 40 patients, 13 (32.50%) patients were obese (BMI = />30) and 16 (40.00%) patients were overweight (BMI = >25 but <30). A total of 11 (27.50%) patients had BMI <25. Obesity was one of the common predisposing factors for OA knee. Various studies have reported obesity to be one of the risk factors for development of OA knee. Holmberg *et al.* conducted a study to investigate the risk of knee OA for men and women in relation to BMI within the normal weight range [15]. For this purpose, a population-based and case-control study was carried out in the southern part of Sweden, including 825 cases with X-ray verified femorotibial OA and 825 age-, sex-, and county-matched population controls on the basis of these findings, the authors concluded that a moderate increase in BMI, within the normal weight range, was significantly related to knee OA among men. Overweight at any time was related to knee OA. Similar correlation between obesity and knee OA was also reported by Singer *et al.* [16] and Gurler [17].

In our study in almost all patients, there was good functional improvement as shown by improvements in KCS and JOA scores. The mean KCS as well as JOA scores at the time of final follow-up was found to be significantly improved as compared to KCS and JOA scores at the time of presentation and the difference was found to be statistically highly significant. Navaneeth *et al.* conducted a study to evaluate the functional outcome of TKA in OA using the KCS [18]. Thirty patients diagnosed with OA of the knee joint were enrolled into the study, all were undergone TKA. The outcome was rated as per KCS. The study found excellent results in 25 cases (83%), good in 3 (10%), and fair in 2 patients (7%) according to KCS whereas 8 excellent (27%), 16 good (53%), 5 fair (17%), and 1 poor (3%) results were found according to knee functional score. Similar outcome in patients of knee OA treated by arthroplasty was also reported by the authors such as Steinhaus *et al.* [19] and Skou *et al.* [20].

Limitation of the study

Small sample size and shorter duration of follow-up were the limitation of the study. A larger cohort of cases would further substantiate the results of this study. Further a longer duration of follow-up may increase the complication rate since there are chances of delayed complications occurring even after 6 months of surgery.

CONCLUSION

TKA remains definitive treatment in patients having moderate-to-severe OA who fails to respond to conservative treatment measures. It is relatively safe procedure having predictable outcome. There is a significant functional improvement in these cases with acceptable complication rates.

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