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ORIGINAL RESEARCH ARTICLE

Functional and Radiological Outcomes of Total Knee Arthroplasty in Osteoarthritis with Varus Deformity of Knee: A Prospective Study

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ABSTRACT

Introduction: Total knee replacement (TKR) is the most commonly performed orthopedic surgical procedure for treating severe arthritis of the knee joint either due to osteoarthritis or due to inflammatory arthropathy. There was cartilage damage in either the medial or patella femoral joint/lateral compartment. Severe pain through deformity develops, subsequently necessitating a total joint replacement. This study assessed the Functional and radiological outcomes of total knee arthroplasty in osteoarthritis with varus deformity of the knee.

Materials and Methods: From February 2021 to July 2022, all patients with osteoarthritis with varus deformity of knee were subjected to total knee arthroplasty after obtaining approval from the Institutional Ethics Committee were required to enroll patients.

Results: The age of the patients in our study was 63.58 years ranging from 52 to 79 years. In 72.09% of the patients were females while the remaining 27.91% were females. In our study, 45% of the patients were overweight while the remaining 59.48% were overweight. In our study, 55.81% of the patients get their left knee operated first while the remaining 44.19% of the patients get their right knee operated first. In 25.58% patella resurfacing was done. The *p-value* was found to be significant between the pre- and post-oper knee society scores. In our study, 5 patients had complications out of which 4.65% of the patients had superficial wound infection, 4.65% of them patient had anterior knee pain and 2.33% had popliteal artery thromboembolism.

Conclusion: Total knee arthroplasty is a relatively safe procedure. Treatment with total knee arthroplasty resulted in greater pain relief and functional improvement after 6 months. It improves the functional ability of the patient and the ability of the patient to get back to pre-disease state, which is to have a pain-free mobile joint, There was a significant association between the knee clinical score and knee functional score at six months follow-up.

Keywords: Total knee arthroplasty, Osteoarthritis knee, Varus deformity of knee.

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INTRODUCTION

Total knee replacement (TKR) is the most commonly performed orthopedic surgical procedures for treating severe arthritis of the knee joint either due to osteoarthritis or due to inflammatory arthropathy. There was cartilage damage in either medial, patellofemoral joint/lateral compartment, and severe pain through deformity develops, subsequently necessitating a total joint replacement. Osteoarthritis was the most common chronic joint disease due to articular cartilage degeneration. Total knee replacement becomes necessary in patients with tricompartmental osteoarthritis in whom pain cannot be satisfactorily controlled by analgesics, physiotherapy involving static quadriceps strengthening exercises and intraarticular injections.[1]

The advantage of primary TKA is to re-establish the normal mechanical axis with a stable prosthesis that is well fixed.[2] Surgical outcomes, patient satisfaction, and implant survival have improved steadily since its introduction and the operation has become widely accepted to afford relief of pain, restoration of range of motion (ROM), stability, and function.[3]

Knee osteoarthritis (OA) results in continued pain and clinically significant functional limitations that reduce the quality of life (QoL) and impair the ability to perform activities of daily living (ADLs).[4,5]

Broad terms in knee replacement were relief of pain, good functional ability and durability. When patients are first diagnosed with OA of the knee, they generally start with conservative treatment aimed at relieving OA symptoms. A stepped care approach consisting of painkillers (usually non-steroidal anti-inflammatory drugs (NSAIDs)), shoe inlays, muscle strength exercises and intra-articular injections with corticosteroids can give (temporary) relief and allow patients to function satisfactorily for a longer period of time. Additionally,

specialized programs in which orthopedic surgeons work together with physical therapists both before and after TKA surgery can improve muscle strength postoperatively. When non-operative treatment fails, surgical options can be considered. In relatively young patients with a significant varus or valgus alignment of the knee, it is possible to perform proximal tibial osteotomies or distal femoral osteotomies, respectively to normalize the alignment. This can unload the medial compartment (in varus OA), or the lateral compartment (in valgus OA), which reduces symptoms and postpones an partial arthroplasty. Uni-compartmental knee OA can be treated by replacing the affected compartment with medial, lateral, or patellofemoral-uni-compartmental knee prosthesis. However, worldwide, the most performed and extensively researched surgical treatment of knee OA is the TKA. Which treatment is most suited for a specific patient is often debatable, and it is important to inform patients about the benefits and risks of each specific type of treatment. This allows patients to decide with their treating physician if surgery and which type would be the best option.

A number of factors have been identified that may contribute to reduced patient satisfaction: Limited OA on the preoperative X-ray of the knee (especially in young active patients), unrealistic patient expectations before surgery, comorbidities like depression and diabetes, and worse preoperative pain scores. These factors can only explain part of the relatively large proportion of unsatisfied TKA patients.

MATERIALS AND METHODS

The present study was conducted in the Department of Orthopaedic Surgery of SRMSIMS, Bareilly from 1st February 2021 to 31st July 2022, in all the patients having osteoarthritis with varus deformity of knee subjected to total knee arthroplasty after obtaining approval from the Institutional Ethics Committee.

Inclusion Criteria

- Severe knee pain
- Varus knee deformity (grade 3 and 4 kellegran and lawerance)
- Knee stiffness (extension lag or flexion contractures) with or without decreased range of motion.
- Medial compartment bone loss upto 2 to 3 mm
- Age more than 50 years
- Flexion contracture upto 15 degree

Exclusion Criteria

- Active infection of knee or anywhere in the body
- Revision arthroplasty
- Young patients less than 50 years of age
- Vascular problems (deep vein thrombosis)
- Having periprosthetic fracture
- Previous implant in knee joint
- Secondary osteoarthritis-post traumatic/post inflammatory/post infection, patients not consenting for the study.

All our patients were evaluated with detailed history and clinical examination. The preoperative medical evaluation was done for all the patients. A medial par patellar arthrotomy was done to expose the knee joint. In knees with varus deformity, there is the sequential release of superficial collateral ligament, deep collateral ligament, pes tendons and semi-membranous muscle from the posteromedial corner of tibia. The trial prosthesis for tibia and femur is fixed with the articular insert, the ligamentous balancing and patellar tracking was assessed. The femoral component will be cemented in a similar fashion with a few additional considerations. Usually, all components are cemented simultaneously. The press-fit articular insert will be fixed to the tibial tray. Tourniquet was released. Complete hemostasis achieved. Wound wash was given. Wound closed in layers with or without suction drain. Sterile dressing was done. In the immediate postoperative period, a compression bandage was applied. Intravenous antibiotics were given for 48 to 72 hours (Figure 1).

Static quadriceps strengthening exercise was taught in immediate postoperatively. Post-op day two patients were ambulated using a standard walker with toe touch walking. About 2nd post-operative day, the dressing and drainage tube will be removed and the wound inspected.

Full weight bearing will be allowed with a walker. In the 3rd post op day, patients were taught dynamic quadriceps exercises and active knee flexion up to 90 degrees. The patient continued supervised physiotherapy until discharge and sutures were removed on 14th post postoperative day. Patients were advised to increase the active knee flexion to attain full range of knee movement

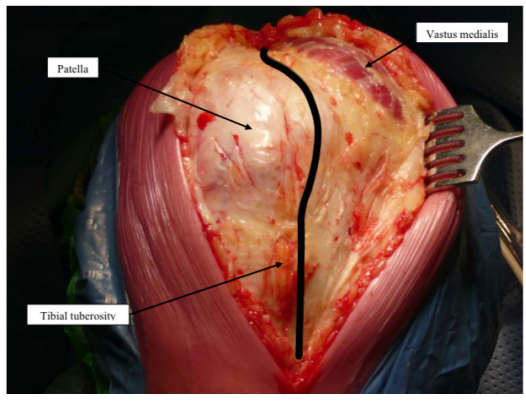

Figure 1: Midline para patellar approach with medial joint arthroplasty

by the end of six weeks and allowed climb stairs by the end of one month.

Follow Up

Patients were followed up clinically, functionally and radiologically at 2, 6, and 24 weeks using the knee society score X-ray and thorough clinical examination.

Statistical Analysis

Data was analyzed using Statistical Package for Social Sciences, version 23 (SPSS Inc., Chicago, IL). Results for continuous variables are shown as mean ± standard deviation (SD), whereas results for categorical variables are shown as numbers (percentage). The *p-values* were calculated with the student t-test.

RESULTS

In our study, the mean age of the patients was 63.58 years, ranging from 52 to 79 years. A majority of the patients aged between 61 and 70 years (53.49%), 32.56% of patients aged between 51 and 60 years, and 13.95% of patients aged >70 years. In our study, 72.09% of the patients were females, while the remaining 27.91% were females. In our study, 45% of the patients were overweight, while the remaining 59.48% .

About 55.81% of the patients get their left knee operated first while remaining 44.19% of the patients get their right knee operated on first were females.

DISCUSSION

This prospective study was conducted to assess the clinical, functional and radiological outcome of TKA using knee society score and to find association between knee functional score and knee score. As with most techniques in modern medicine, more and more patients are receiving the benefits of total knee arthroplasty (TKA). This advances in the knee implant design and the surgical techniques for total knee replacement achieved successful results in reducing the pain and providing with a stable joint. In our study, average age of the patients was 63.58 years which clearly depicts the fact that TKR was performed at older age. There were more women, 32 (72.09%) than men 12 (27.91) of TKR. But there was no significant difference in knee and functional scores among all age groups. Williams D *et al.*[6] reported that 2456 patients undergoing total knee replacement the mean age of the study cohort was 71.4 years (SD 9.1;17.7–95.8); there were 962 men (39.2%) and 1494 women(60.8%).

In our study out of 43 patients 20 were overweight and 23 patients were obese and mean body mass index (BMI) at the time of surgery was no correlation was found between BMI and knee society score. Williams D *et al.*[6] reported that 2456 patients undergoing total knee replacement, he mean BMI at the time of surgery was 28.9 kg/m2 and no difference in at either six months or two years was demonstrated in the mean BMI (Tables 1 and 2).

A common assumption is that overloading of the knee occurs in patients with high BMI, resulting in greater impact loading across the tibial component, therefore, increased component loosening and poorer implant survival. But no significant difference b/w functional and radiological outcomes in obese groups was found in our study and other studies. In our study 11 patients patella were resurfaced out of 43 patients and no significant difference in knee society score were found between both the groups (Tables 3 and 4).

Wood DJ *et al.*[7] concluded that total knee arthroplasty with patellar resurfacing exhibited inferior clinical

Table 1: Correlation between age and knee scores

	Pre-operative	*Post-operative*	*2 weeks*	*6 weeks*	*24 weeks*
Correlation coefficient	–0.090	0.162	–0.141	–0.130	0.161
Significance	0.46	0.61	0.42	0.50	0.47
p-value	0.46	1.75	5.45	5.31	0.01

Table 2: Correlation between age and functional scores

	Pre-operative	Post-operative	2 weeks	6 weeks	24 weeks
Correlation coefficient	–0.12	–0.35	0.325	–0.163	–0.332
Significance	0.39	0.17	0.09	0.51	0.13
p-value	1.88	3.76	0.0002	0.0001	0.126

Table 3: Correlation between BMI and knee scores

	Pre-operative	*Post-operative*	*2 weeks*	*6 weeks*	*24 weeks*
Correlation coefficient	–0.147	–0.122	–0.109	–0.059	–0.090
Significance	2.07	0.22	0.04	0.31	0.18
p-value	4.24	4.25	2.06	4.93	4.59

Table 4: Correlation between BMI and functional scores

	Pre-operative	*Post-operative*	*2 weeks*	*6 weeks*	*24 weeks*
Correlation coefficient	–0.135	0.019	0.041	–0.083	–0.051
Significance	0.001	0.81	0.50	0.27	0.44
p-value	3.76	2.79	9.67	6.11	2.05

Table 5: Correlation between patellar resurfacing and knee scores

	Pre-operative	*Post-operative*	*2 weeks*	*6 weeks*	*24 weeks*
Correlation coefficient	1.89	1.06	1.07	0.789	0.905
Significance	0.63	0.53	0.005	0.69	0.11
p-value	0.94	0.85	0.18	0.01	0.53

Table 6: Correlation between patellar resurfacing and functional scores

	Pre-operative	*Post-operative*	*2 weeks*	*6 weeks*	*24 weeks*
Correlation coefficient	1.47	1.36	–0.21	–0.24	–1.13
Significance	0.19	0.01	0.71	0.70	0.04
p-value	0.11	0.003	0.09	0.18	0.005

Table 7: Pre-operative and post-operative knee society scores

Knee society scores		*Mean*	*SD*	*Min*	*Max*	*p-value*
Pre-operative		49.23	8.36	32	65	
Post-operative						
	Immediate	36.48	3.20	30	40	<0.0001
	2 weeks	62.09	5.90	50	75	
	6 weeks	71.86	5.35	60	80	
	24 weeks	83.21	4.63	75	90	

Table 8: Pre-operative and post-operativefunctional scores

Functional scores		*Mean*	*SD*	*Min.*	*Max.*	*p-value*
Pre-op.		48.95	7.28	30	65	
Post-op.						
	Immediate	15.81	4.07	10	20	<0.0001
	2 weeks	58.49	5.29	50	65	
	6 weeks	73.26	4.21	65	80	
	24 weeks	82.44	4.74	70	90	

Table 9: Distribution of patients according to complications

Complications	*No.*	*%*
Superficial wound infection	2	4.65
Anterior knee pain	2	4.65
Popliteal artery thromboembolism	1	2.33

results as compared to total knee arthroplasty with patellar retention. Total knee arthroplasty with patellar resurfacing exhibited significant limitation of knee extension, which was significantly associated with the presence of post-surgery anterior knee pain (Tables 5 and 6).

In our study, the mean clinical score improved from 49.23 preoperatively to 83.21 postoperatively and the mean knee functional score improved from 48.95 preoperatively to 82.44 postoperatively (Tables 7 and 8).

Williams D *et al.*[6] reported in study that 2456 patients undergoing total knee replacement showed clinically significant differences in knee society score.

Kim TH *et al.*[8] reported in their case series of 168 knees improvement of the mean knee clinical score from 21 preoperatively to 96 postoperatively and knee functional score from 39 to 77 in the mild varus group at two-year follow-up and improvement of mean clinical score from 14 preoperatively to 97 postoperatively and the functional score from 33 to 79 in the severe varus group at two-year follow-up.

In our study, 4.65% of patients had a superficial infection at one-month follow-up. Patients were treated

with antibiotic therapy for 6 weeks. The patients were recovered from acute superficial infection without any residual deformity and restricted ROM of the involved knee.

In our study, 2.3% of patients had anterior knee pain. The pain was mild to moderate in these patients, so they were treated conservatively with analgesics and quadriceps strengthening exercises. Sensi L *et al.*[9] reported in 50 patients, 8% of patients had anterior knee pain which was found similar in our groups.

In our study of 43 patients one patient had popliteal artery thrombus as a complication which was managed with immediate vascular surgeon consultation and embolectomy. Tsujimoto R *et al.*[10] reported that an acute popliteal artery occlusion in an 83-year-old male following revision TKA (Table 9).

Ohira T *et al.*[11] reported that an acute popliteal thrombus in a 71-year-old male with calcium pyrophosphate dihydrate crystal deposition disease.

Matziolis G *et al.*[12] reported popliteal thrombus in a healthy 69-year-old female with a BMI of 35, and a 74-year old female with a history of DVT in the contralateral leg after TKA.

Popliteal artery thrombus following TKA is a rare, but serious complication that can result in limb amputation or death. Significant risk factors specific to popliteal artery injury following TKA, include: revision surgery, peripheral vascular disease, renal failure, coagulopathy, and metastatic cancer. General thrombotic risk factors include trauma or fractures, major orthopedic surgery, hypercoagulability, previous thrombotic event, age, and metabolic syndrome.

CONCLUSION

Total knee arthroplasty is a relatively safe procedure. Treatment with total knee arthroplasty resulted in greater pain relief and functional improvement after 6 months. It improves the functional ability of the patient and the ability of the patient to get back to the pre-disease state, which is to have a pain-free mobile joint. There was a significant association between the knee clinical score and knee functional score at six months follow-up. Total knee replacement using a non-constrained, PS design and medial parapatellar approach gives functionally excellent pain relief, increased ROM, restoration of normal function, low prevalence of patellofemoral complications, correction of varus and fixed flexion deformities and restoration of normal mechanical alignment. Postoperatively, patients with near-normal radiographic alignment have good functional outcomes and faster rehabilitation. Correct positioning of the components axially and rotationally improves the functional and radiological outcomes. However, longer follow-up is needed to determine the long-term effect of posterior substitute design.

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