

Original Research Article

Outcome of posterior cruciate ligament-retaining primary total knee arthroplasty in arthritic patients

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ABSTRACT

Background: The incidence of arthritis is rising in India due to increase in the proportion of ageing population and obesity. Cruciate retaining total knee arthroplasty (TKA) is a promising mode of treatment for end stage arthritis, with excellent functional outcome. Hence, we have evaluated the functional outcome of posterior cruciate ligament retaining TKA and the problems related to the procedure at our institute.

Methods: This prospective study was conducted on 30 patients who underwent posterior cruciate ligament retaining primary TKA at a tertiary health care centre between December 2012 and May 2014. Patients were evaluated using Knee society score (knee score and function score) at regular follow up visits.

Results: The study included TKA for 42 knees in 30 patients. Indications for TKA were osteoarthritis in 37 knees and rheumatoid arthritis in 5 knees. The average follow-up period was 24 weeks. All the 42 knees had poor knee score (<60) and poor functional score (<60) preoperatively. Postoperatively 37 knees had excellent (80-100) and 5 knees had good knee score (70-79) whereas 22 patients had excellent (80-100), 5 patients had good (70-79), 2 patients had fair (60-69) and 1 patient had poor functional score (<60).

Conclusions: Our study demonstrates that posterior cruciate retaining TKA is a reliable procedure with excellent functional outcome, pain relief and early return of patients to their daily activities. Posterior cruciate retaining TKA provided excellent knee society score and functional score in majority of patients.

Keywords: Posterior cruciate ligament retaining, Total knee arthroplasty, Knee society score

INTRODUCTION

Total knee joint arthroplasty (TKA) is undoubtedly one of the surgical success stories of modern times.¹ Number of primary knee arthroplasties performed annually increased exponentially in the 21st century. Prevalence of knee osteoarthritis, the most common indication for TKA is high in Indians (5.5% in urban and 3.3% in rural).² Arthritis of the knee joint causes severe disability with restriction of activities of daily living and TKA is now a reliable and well established gold standard treatment for severe arthritis of knee joint. With increase in life expectancy and high demands of patients both young and elderly the number of patients undergoing TKA is increasing day by day.³

Posterior cruciate ligament retention in TKA achieves an increased potential range of motion by effective femoral roll back and cruciate retaining designs better retain normal physiologic control of knee flexion. This may be clinically relevant during activities that require substantial biomechanical demands, such as squatting, kneeling and climbing stairs. Kinematics in a cruciate-retaining TKA is not directed by the prosthesis but rather by the ligaments and dynamic forces about the knee. Several innovative improvisations in implant design and surgical techniques are developed and various systems are available with specific features regarding the geometry of the components, the degree of congruity of the articulating surfaces, which have helped in achieving

the absolute normal kinematics and functions of the knee after posterior cruciate retaining TKA.⁴⁻⁶

Studies on the functional outcome of posterior cruciate ligament retaining TKA are limited. Hence, we assessed the improvement in pain relief, stability and mobility of the joint and complications associated with posterior cruciate retaining TKA.

METHODS

This prospective study on the functional outcome of 30 knees who underwent total knee replacement using cemented posterior cruciate retaining implants at Vydehi institute of medical sciences and research center during the year December 2012-May 2014. The study was approved by the institutional ethics committee and a written consent was obtained from all participants. Adult patients with either primary or secondary arthritis with or without deformities are included in the study. Patients with sepsis of knee joint, neuropathic joints, neuromuscular disorders and local skin lesions were excluded from the study.

A detailed history was elicited and a thorough clinical examination was performed. All participants underwent X-ray knee joint (antero-posterior and lateral view) pre and post-operatively. Preoperative blood investigations included complete blood count, fasting blood glucose, glycated hemoglobin, renal function tests, liver function tests, coagulation profile, anti HIV and HBsAg. Knee society score (KSS) was evaluated preoperatively and post-operatively.

Surgery was performed under spinal anesthesia with or without epidural anesthesia. Patient positioned supine and his operating leg was positioned in flexion. A broad spectrum antibiotic like intravenous (IV) cefoperazone and sulbactam combination (1.5 g) and 1g IV infusion of tranexamic acid was given before tourniquet application. A thorough scrub was given and the part was painted with betadine solution. Sterile stockinet was used to drape the limb exposing only the operating area. Sterile drape was used for operative site.

A standard midline approach with knee in flexion was used from upper pole of patella till tibial tuberosity. Deeper anteromedial dissection was followed for arthrotomy. Medial, lateral and posterior soft tissue release (either minimal or extensive) was done for soft tissue balancing and correction of deformities. Tibial and femoral osteophytes were excised. Tibial sectioning was done using extra-medullary reference cutting. Posterior cruciate ligament was retained in all knees. Femoral section was done with appropriate femoral rotation with reference to epicydylar line or White slide line. Whenever needed Tibial defects were managed by autologous posterior condylar grafts with screws or with wedge augmentation.

The alignment and soft tissue balance was checked in extension and flexion. Trial components were assembled for proper fit and checked for soft tissue tension and balancing in flexion and extension. Circumpatellar electrocautery in all knees and removal of osteophytes from patella without patellar resurfacing was done. Patellar tracking was noticed normal in all. Cementing of components was done by using one packet of bone cement. Second dose of 500 mg IV infusion of tranexamic acid was given. Tourniquet was released; hemostasis was achieved by cauterization. Drain was kept, wound was closed in layers. Antibiotics continued post operatively for 5 days. Standard postoperative protocol was followed to develop quadriceps, to improve the range of motion and early weight bearing ambulation with support to start with. Sutures were removed at the end of two weeks postoperatively.

Immediate post-operative and follow-up clinical radiological evaluation was done at regular intervals. Final evaluation was done using KSS scoring system. All cases were photographically documented and were regularly followed-up at 6, 8, 12 and 24 weeks.

The data was analysed using SPSS Version 19.0; IBM, SPSS Inc., Chicago, IL, USA. Continuous variables are expressed as mean \pm SD and categorical variables are expressed as number and percentages. Independent t test was used to compare continuous variables whereas Chi square test was used to compare categorical variables. A p value less than 0.05 was considered statistically significant.

RESULTS

Table 1: Demographic and clinical characteristics of the study population.

Characteristic	Observed value
Age (years)	60.60 \pm 8.54
Male: female	15:15
Occupation	
Daily laborers	2
Employees	7
Farmers	6
Homemakers	14
Mechanic	1
Indication for TKA	
Osteoarthritis	25
Rheumatoid arthritis	5
Unilateral: bilateral TKA	18:12
Comorbidities	
Essential hypertension	9
Diabetes mellitus	4
Bronchial asthma	2
Obesity	4
Ischemic heart disease	1

TKA: total knee arthroplasty.

Demographic and clinical characteristics of the study population are summarised in Table 1.

Effect of TKA on knee score

Preoperative score for pain was 14.8 which increased significantly with TKA to 47.5 ($p < 0.001$). Average preoperative flexion was 91.09 degrees which significantly improved to 111.67 degrees postoperatively ($p < 0.001$).

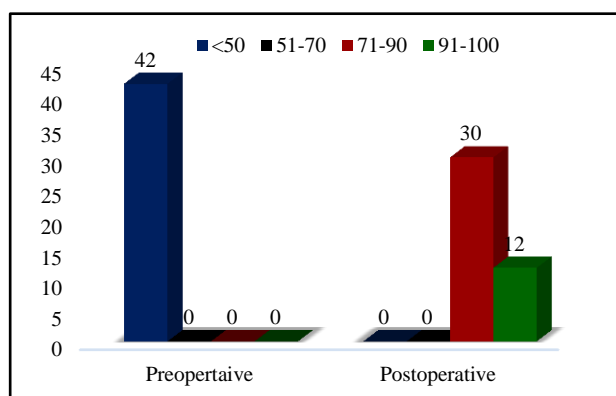


Figure 1: Distribution of operated knees in various knee score groups pre and postoperatively.

Preoperatively there were one knee with fixed flexion deformity (FFD) >20 degrees, one knee with FFD of 16-20 degrees, five knees with FFD of 11-15 degrees and 27 knees with FFD of 5-10 degrees preoperatively. Postoperatively number of knees with no FFD increased significantly to 39 whereas two knees still had FFD of 11-15 degrees and one knee had FFD of 5-10 degrees. Preoperatively one knee had an extension lag of >20 degree, five knees had an extension lag of 10-20 degrees and 36 knees with extension lag of <10 degrees. Postoperatively number of knees with extension lag of <10 degrees increased to 41 knees and only one knee still had an extension lag of 15 degrees.

There was significant improvement in overall knee score with posterior cruciate retaining TKA (35.48 ± 10.67 to 88.09 ± 5.89 , $p < 0.001$). Number of operated knees in various knee score groups preoperatively and postoperatively is depicted in Figure 1. All patients had a poor knee score (<60) preoperatively. The procedure improved knee score in all operated knees; postoperatively 37 knees had excellent score (80-100) and five knees had good score (70-79).

Average preoperative knee score in osteoarthritis knees were 34.89 and postoperative knee score in osteoarthritis knees were 87.83. In rheumatoid arthritis knees the average preoperative knee score was 39.8 and postoperative knee score were 90. No significant difference was observed in improvement of knee score between the two disease groups.

Effect of TKA on function score

In this study, one patient was housebound, 14 patients could walk <5 blocks and 15 patients had walking ability of 5-10 blocks preoperatively. Postoperatively number of patients who could walk unlimited distance significantly increased from none to nine whereas 18 patients had limited walking capacity but could walk >10 blocks and three patients could walk 5-10 blocks ($p < 0.001$).

Preoperatively no patients were able to walk stairs up and down normally, 17 patients were able to walk stairs up and down with rail, 11 patients were able to walk up with rails but unable to walk down and two patients were unable to walk both up and down stairs. Postoperatively nine patients were able to walk both up and down of stairs, 17 patients had were able to walk both up and down with rails and four patients were able to walk up with rails but unable to walk down ($p < 0.001$).

Preoperatively 20 patients were using one cane, 4 patients were using two canes, 3 patients were using walker whereas 3 patients were walking without any support. Postoperatively 16 patients were able to walk without any support and only 14 patients were using one cane as support.

Average preoperative functional score in osteoarthritis knees is 38.6 and postoperative functional score was 80. In rheumatoid arthritis knees average preoperative functional score was 49 and postoperative functional score was 88. No significant difference was observed in improvement of function score between the two disease groups.

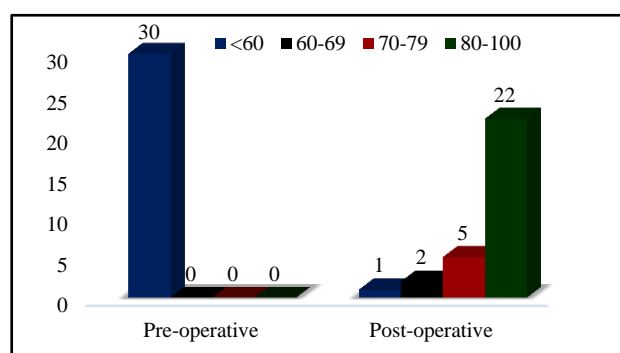


Figure 2: Distribution of operated knees in various functional score groups pre and postoperatively.

There was also significant improvement in function score with posterior cruciate retaining TKA (39.83 ± 14.11 to 81.33 ± 9.64 , $p < 0.001$). Number of operated knees in various functional score groups preoperatively and postoperatively is depicted in Figure 2. All patients had a poor functional score (<60) preoperatively; postoperatively 22 patients had excellent score (80-100), five patients had good score (70-79), two patients had fair

score (60-69), and one patient had poor score (<60). No complications associated with TKA were observed.

DISCUSSION

In our study of we evaluated 30 patients (42 knees) who underwent TKA. There were 15 (50%) female patients and 15 (50%) male patients in our study which is in contrast to most of the previous studies in which there was predominance of female patients (Table 1).⁵⁻¹¹ Our patients were younger than those in most of the previous studies except one.⁵⁻¹¹

Most of the indications for TKA in our study were due to osteoarthritis (37 knees) and rheumatoid arthritis (5 knees). Similarly, indication for majority of the TKA performed in previous studies was osteoarthritis.^{8,11} In our study, 12 patients (40%) underwent bilateral TKA whereas 18 patients underwent unilateral TKA. Compared with other studies we had a significantly higher number of patients who underwent bilateral TKA.^{6,8}

In our study preoperative score for pain was 14.8 and postoperative score was 47.5, which showed a significant improvement. Similar improvements in pain score from 14.1 to 49.3 and 6.9 to 42.6 has been previously reported with TKA.^{7,10}

Average range of movement in our study preoperatively was 91.9 degrees of flexion which increased to 111.6 degrees postoperatively with an improvement of 20.5 degrees. Similar benefits in range of movements were obtained in most of the previous studies.^{6-8,11} However the improvement in range of movement in our study was less when compared to a study by Kolisek et al, and more when compared with a study by Hanusch et al.^{5,10}

One knee had an extension lag of >20 degree, five knees had an extension lag of 10-20 degrees and 36 knees with extension lag of <10 degree preoperatively. Postoperatively 41 knees had an extension lag of <10 degrees and one knee with an extension lag of 15 degree. Similarly, Wang et al showed a significant improvement in extension lag from 6.8 degrees preoperatively to -1 degree postoperatively whereas Hanusch et al showed improvement of extension lag from 5.2 degrees preoperatively to 0.7 degrees postoperatively.^{8,10}

Preoperatively there were three knees with 16-20 degrees of varus, 17 knees with varus of 11-15 degrees, 16 knees with 5-10 degrees of varus, four knees with 0-4 degrees of varus and one knee with > 10 degrees of valgus. Postoperatively we had 41 knees with normal valgus of 5-10 degrees and one knee with valgus of 11-15 degrees. Wang et al showed average alignment of 7.6 in 146 knees and average valgus alignment of 12.2 in 11 knees preoperatively was reduced to valgus alignment was 6.9 degrees postoperatively.⁸

In our study average knee score preoperatively was 35.48 which increased postoperatively to 88.09. Postoperatively 37 knees had an excellent knee score and five knees had a good knee score. These results are comparable with the most of the previous studies where they also indicated a significant improvement in knee score following cruciate retaining TKA.^{5,7,8,10,11}

In our study, 30 patients had poor functional score preoperatively. Postoperatively 22 patients had excellent score (80-100), five patients had good score (70-79), two patients had fair score (60-69) and one patient had poor score (<60). Preoperative mean score of 39.83 increased significantly to 81.33 postoperatively. These results are comparable with previous studies which also showed a significant improvement in function score with TKA.^{5-8,10}

In our study, average postoperative knee and functional score in osteoarthritis knees were numerically lower than in rheumatoid arthritis knees. This is probably due to lower preoperative knee and functional score in osteoarthritis knees than rheumatoid arthritis knees suggesting no significant difference in outcomes between knees with the two diseases.

In our study we didn't encounter any of the complications associated with TKA. Simultaneous-bilateral TKA is associated with a notable reduction in the incidence of periprosthetic knee infection and mechanical failure but a moderately higher risk of adverse cardiovascular outcomes when compared with staged-bilateral TKA. Hence, simultaneous-bilateral knee arthroplasty may be the preferred surgical strategy in most of the patients with low cardiovascular risk.¹²

CONCLUSION

Our study demonstrates that posterior cruciate retaining TKA is a reliable procedure which provides excellent pain relief with early return of the patients to their daily activities and provides excellent knee society score and functional score in majority of patients.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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