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# Functional outcome of posterior cruciate ligament substituted total knee arthroplasty

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**Abstract**
**Background and Aim:** Total Knee Arthroplasty (TKA) is now most reliable treatment for severe arthritis. However, there is a need of a study to accurately assess and analyze the approach of a surgeon towards PCL and measure its outcome. We aimed to study clinical and functional outcome following posterior cruciate ligament substituted total knee arthroplasty.
**Material and Methods:** Present research was carried out at Department of Orthopedics, Tertiary Care Institute of India where 50 patients were operated, 78 Total knee replacements done on 50 patients for the duration of two years. All patients were assessed clinically and functionally using the Oxford knee score. The preoperative medical evaluations of all patients were done to evaluate any potential complications that can be life-threatening or limb-threatening.
**Results:** Most of the patients in study have excellent outcome 72% followed by good results of 14% after treatment. Out of 50 patients and 6 patient had post op suprapatellar fullness, which was relieved with medications for 3 weeks and 3 patients without no signs of immediate post-operative period, developed infection after 6 months followed which underwent staged revision total knee replacement.
**Conclusion:** Post operatively, patients had pain free joint movements with correction of deformity. In patients with advanced osteoarthritis, gross varus deformity, fixed flexion deformity posterior cruciate ligament sacrificing total knee replacement will give greater mobility and function.

**Keywords:** Osteoarthritis, oxford knee score, posterior cruciate ligament, total knee arthroplasty

## Introduction
In most arthritic knees, some degree of instability, deformity, contracture, or a combination of these elements, can be found. The common causes of arthritis of the knee in adults include Osteoarthritis (OA), Rheumatoid Arthritis (RA), Post-Traumatic Arthritis or Secondary Osteoarthritis and other types of inflammatory arthritis. Osteoarthritis is thought to be the most prevalent chronic joint disorders. The role of posterior cruciate ligament (PCL) in total knee replacement is controversial [1]. Theoretically, it has been suggested that PCL retaining can produce femoral rollback, which increases the range of flexion and prevents posterior translation [2, 3]. This in effect, reduces loosening and excessive polyethylene wear by decreasing the shear stresses at the fixation surfaces. We conducted a prospective study to compare resection with retention of PCL using a standard PCL retaining cemented total knee replacement and assessed the functional outcome using functional knee scores (FKSs) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score, the axis for this movement can be simplified as a horizontal line passing through the femoral medial and lateral epicondyles.
Total knee replacement, is a surgical procedure to replace the weight-bearing surfaces of the knee joint to relieve pain and disability. It is most commonly performed for osteoarthritis and also for other knee diseases such as rheumatoid arthritis and psoriatic arthritis. In patients with severe deformity from advanced rheumatoid arthritis, trauma, or long standing osteoarthritis, the surgery may be more complicated and carry higher risk. Most common indication for total knee replacement is osteoarthritis. Various factors are associated with the onset and progression of clinical osteoarthritis. These include genetic factors, age, sex, obesity, occupation, abnormal loading of the joint as in kneeling, squatting and cross legged sitting [4, 5].

Total Knee Arthroplasty (TKA) is now most reliable treatment for severe arthritis [6]. However, there is a need of a study to accurately assess and analyze the approach of a surgeon towards PCL and measure its outcome. There are some studies in the literature which have specifically compared cruciate- retaining and cruciate substituting designs [7]. We aimed to study clinical and functional outcome following posterior cruciate ligament substituted total knee arthroplasty.

## Material and Methods

Present research was carried out at Department of Orthopedics, Tertiary Care Institute of India where 50 patients were operated, 78 Total knee replacements done on 50 patients for the duration of two years. They were followed up for a minimum period of 1 year and evaluated for clinical outcome using X-rays and Oxford knee score. Patients were followed at 1 month, 3 months, 6 months and 1-year, post-surgery. The pre and post-operative pain, deformity and functional outcomes were compared.

### Inclusion criteria

Patients aged 50-70, both male and female with primary both bilateral and unilateral osteoarthritis, traumatic osteoarthritis, genu varus/valgus deformities.

### Exclusion criteria

Patients having gross medial and lateral collateral ligament instability, Infective conditions like septic arthritis, previous history of surgery to knee including arthroscopy, Progressive neuromuscular disorders, Ankylosed knees, dermatological and infective conditions around knee and Patients with fixed flexion deformity more than 40 degrees.

Detailed history of all patients was taken. All patients were assessed clinically and functionally using the Oxford knee score. The preoperative medical evaluations of all patients were done to evaluate any potential complications that can be life-threatening or limb-threatening. Out of 50 patients, 37 patients had only varus deformity and 13 patients had varus and fixed flexion deformity less than 40 degrees.

### Radiographic assessment

Standard guidelines were utilized to obtain knee radiographs-standing anteroposterior view, a lateral view, and a skyline view of the patella. Any collateral ligament laxity, subluxation of tibia, presence of osteophytes, any bone defects in the tibia and femur and the quality of bone was assessed. Sizing of the femoral and tibial components was also done.

### Operative technique

All patients after thorough pre-op evaluation, were taken up for surgery under combined epidural and spinal anesthesia, all patients received 1gm of ceftriaxone 15 min prior to surgery and tourniquet inflation done. A standard midline medial parapatellar approach was used with knee in 90 degrees flexion. Distal femoral 5-7 degrees of valgus cut is made with help of intramedullary jig and tibial cut is done perpendicular to mechanical axis with the help of extramedullary jig. Femoral and tibial sizing done and appropriate preparation is made. Soft tissue balancing done with trial components in-situ, in both flexion and extension. All patients underwent total knee arthroplasty using posterior cruciate substituting design implants. Patella is not resurfaced, and circumferential denervation of patella was done. At the end of procedure tourniquet is removed hemostasis is achieved and wound closed in layers over the drain. All patients are mobilized from post-op day 1. Drain was removed on 2nd post-op day following which intensive physiotherapy under supervision was given to all patients. Unilateral operated patients are discharged after 1-week; bilateral patients are discharged after 2 weeks. Patients were evaluated clinically and radiologically at an interval of 1month, 3 months, 6 months and 1 year, in Orthopaedic OPD.

Oxford knee score- activities and participation questionnaire (OKS-APQ) The OKS-APQ represents an optional additional scale, designed to be used in conjunction with the OKS. Initially it is scored in the same way as the OKS i.e. Score each question (item) from 0 to 4 with 0 being the worst outcome and 4 being the best outcome. However, to produce the overall score for the OKS-APQ the resulting summed score, [with possible range from 0 (worst), to 32 (best possible score)], is then converted to a 0 to 100 score. This is simply achieved by taking the resulting summed score (within range 0 to 32), dividing by 32 and then multiplying by 100, as in:

$$Resulting\ summed\ score \div 32 \times 100$$

OKS=X (0=worst possible score, 48= best possible score) [if subscales are used

OKS functional component score=X (0=worst possible score, 100= best possible score) OKS pain component' score=X (0=worst possible score, 100= best possible score)] OKS-APQ=Y (0=worst possible score, 100=best possible score) The OKS is a 12-item questionnaire on activities of daily living. The OKS has been developed and validated specifically to assess function and pain after TKR. Out of 12 items, 5 for assessing pain and 7 for assessing function. Each item is worth equal weighting (1 to 5) for a total possible score ranging from 12 to 60. A higher score indicates a better outcome. The outcome categories based on oxford knee scoring system: excellent (40-48), good (30-39), fair (20-29) and poor (0-19)

## Results

Study done in 50 patients who underwent total knee arthroplasty using posterior cruciate substituting design. The majority of the patients were from age group of 61-65 years. The youngest patient was 52 years of age and oldest was 68 years. There was a male predominance in our study. There was a predominance of right side. Out of 50 patients, 45 were diagnosed as primary osteoarthritis and 5 were post traumatic osteoarthritis.

Most of the patients in study have excellent outcome 72% followed by good results of 14% after treatment. Out of 50 patients and 6 patient had post op suprapatellar fullness, which was relieved with medications for 3 weeks and 3 patients without no signs of immediate post-operative period, developed infection after 6 months followed which underwent staged revision total knee replacement.

**Table 1:** Demographic details of the study participants

| Variable | Number | Percentage (%) |
|---|---|---|
| **Age (years)** | | |
| 50-55 | 4 | 8 |
| 56-60 | 8 | 16 |
| 61-65 | 24 | 48 |
| 66-70 | 14 | 28 |
| **Gender** | | |
| Male | 32 | 64 |
| Female | 18 | 36 |
| **Side of the Injury** | | |
| Right | 27 | 54 |
| Left | 23 | 46 |
| **Cause of the Injury** | | |
| Primary Osteoarthritis | 45 | 90 |
| Traumatic Osteoarthritis | 5 | 10 |

**Table 2:** The Oxford knee score outcome in study

| Score | Number | Percentage (%) |
|---|---|---|
| Excellent | 36 | 72 |
| Good | 7 | 14 |
| Fair | 4 | 8 |
| Poor | 3 | 6 |

## Discussion

Total knee replacement is a surgical procedure to replace the weight-bearing surfaces of the knee joint to relieve pain and disability. It is most commonly performed for OA and also for other knee diseases such as rheumatoid arthritis and psoriatic arthritis. In patients with severe deformity from advanced rheumatoid arthritis, trauma, or longstanding OA, the surgery may be more complicated and carry higher risk. Analyzing the functional outcome, it was found that all the patients in both the groups had significant improvement in their knee score and the FKS.

Swanik *et al*. found that following total knee arthroplasty, patients were able to reproduce joint position and improve mobility significantly [8]. These changes may result from the retensioned capsulo-ligamentous structures and reduced pain and inflammation.

Gait analysis by Andriacchi *et al*. and others found that individuals with PCL retaining prostheses have a more symmetrical gait, especially during stair climbing, than do individuals with either PCL-sacrificing/PCL-substituting designs [9]. They showed decreased knee flexion during stair climbing and a tendency to lean forward in a quadricepss paring posture in patients with PCL-sacrificing/PCL substituting designs. They postulated that these observations may indicate inadequate rollback of these designs or possibly the loss of a proprioceptive role of the PCL. These observations have been cited as reasons to retain the PCL. Gait analysis in studies contradicts the conclusions of these earlier studies, however, after comparing PCL-substituting/sacrificing knees with normal controls [10].

A randomized trial by Maruyama *et al*. comparing patients with bilateral TKR, identified a greater range of movement with PCL substituting/sacrificing as compared with PCL retaining TKR [11]. A recent meta-analysis concluded that there was an improvement in flexion of 8° in PCL substituted designs compared with PCL-retention [12]. However, any improvement in flexion seemed limited and not associated with improved function. Other investigators have not detected improved flexion with PCL substitution/sacrificing. The PCL may not function even when a PCL-retaining design is used.

Barrack *et al*. found that total knee arthroplasty with retention of the patella yielded clinical results that were comparable with those after total knee arthroplasty with patellar resurfacing [12]. Barrack *et al*. concluded that postoperative anterior knee pain is related either to the Component design or to the details of the surgical technique, such as component rotation, rather than to whether or not the patella is resurfaced. Nutton *et al*. concluded that knee function was not improved by patella resurfacing when compared to a matched group of patients without resurfacing [13]. Wood *et al*. concluded that total knee arthroplasty with patellar resurfacing exhibited inferior clinical results as compared to total knee arthroplasty with patellar retention [14].

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.[14] Patellar resurfacing does not guarantee a painless patellofemoral joint. In our study, all patella's were not resurfaced. All patella's were circumferentially enervated. There was no anterior knee pain in any of our subjects [14].

## Conclusion

Total knee arthroplasty improves the functional ability of the patients. Post operatively, patients had pain free joint movements with correction of deformity. In patients with advanced osteoarthritis, gross varus deformity, fixed flexion deformity posterior cruciate ligament sacrificing total knee replacement will give greater mobility and function. In patients with osteoarthritis and fixed flexion deformity total knee arthroplasty is preferred mode of management.

## Conflict of Interest

Not available

## Financial Support

Not available

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