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Original Article

Evaluation of the Functional Outcome of Total Knee Arthroplasty Posterior Cruciate Ligament Retaining Versus Sacrificing

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Abstract

Introduction: The role of posterior cruciate ligament (PCL) into total knee replacement is controversial. Theoretically, it has been suggested that PCL retaining can produce femoral rollback, which increases the range of flexion and prevents posterior translation. This in effect, reduces loosening and excessive polyethylene wear by decreasing the shear stresses at the fixation surfaces.

Aim: The aim of the study is to prospectively compare the functional outcome of primary total knee replacement between patients in whom PCL was retained with those in whom it was sacrificed using the Knee Society knee scoring and functional knee score (FKS) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) questionnaires.

Materials and Methods: This is a prospective study in which 26 patients were randomly selected, and PCL retaining surgery was done for some patients and PCL sacrificing surgery was done in the remaining patients. WOMAC score, total knee score, and FKS were used to assess outcome.

Conclusion: Total knee arthroplasty inpatient in which PCL was sacrificed was found to have a better functional outcome as compared to the retaining group, which can be mainly attributed to the persistence of flexion deformity in cruciate retaining group.

Key words: Arthroplasty, Osteoarthritis knee, Posterior cruciate ligament retaining, Posterior cruciate ligament sacrificing

INTRODUCTION

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 during the period between January 2 flexion/extension, the axis for this movement can be simplified as a horizontal line passing through the femoral medial and lateral epicondyles. Although the transepicondylar axis represents the axis of flexion and extension, this axis is not truly fixed but keeps shifting during range of motion which is because of the incongruent large articular surface of femur and small tibial condyle creating a problem when the femur flexes on the fixed tibia.[4]

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Aim

The aim of the study is to prospectively compare the functional outcome of primary total knee replacement between patients in whom PCL was retained with those in whom it was sacrificed using the Knee Society Knee Scoring and FKS and WOMAC questionnaires.

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MATERIALS AND METHODS

This is a prospective study conducted in the Department of Orthopaedics, Tirunelveli Medical College Hospital. The Institutional Ethics Committee approval and informed consent from the patients were obtained. Inclusion criteria: Osteoarthritis (OA) and rheumatoid arthritis, this includes varus as well as valgus knees, age >50 years, Kellgren and Lawrence Grade 3 and 4. Exclusion criteria: Age <50 years, minimal degenerative changes (KL I and II), poor skin conditions, posttraumatic arthritis, varicose veins.

Criteria for retaining PCL:
- Structurally intact PCL
- Fixed flexion deformity of <15°
- Varus of <10°
- Valgus of <10.°

Criteria for sacrificing PCL:
- Fixed flexion deformity of more than 15°
- Valgus or varus more than 10°
- Structurally contracted PCL
- Technical inability to properly balance PCL.

Surgical Technique

For a successful total knee replacement, meticulous planning and evaluation is a must, and a neatly performed surgery has a better outcome (25,27). Pre-operative detailed history of the patient's complaints is obtained regarding the duration of pain, the daily activities affected out of the disease. Any infective focus, varicose vein, deep vein thrombosis must be ruled out. Clinical evidence for any ligamentous instability is also checked. Blood investigations were performed to rule out any inflammatory pathology with the patient in the supine position. Two bolsters were fixed using plaster to the table for allowing knee flexion of 30° and 90°. Surgery was done under epidural anesthesia. The most commonly used skin incision for total knee arthroplasty is anterior midline incision. Skin incision extends from 4 cm above the patella to 4 cm below the patella. Medial parapatellar approach is used commonly as this approach can be easily extended or converted to a more extensive traditional approach when additional exposure is necessary. Arthrotomy is performed about 1-2 cm above the superior pole of the patella, and extended to the level of the tibial tubercle. Soft tissue release, femoral sizing, extramedullary tibial resection femoral preparation, A-P femoral resection, trail femoral component is applied to the resected distal femur, and the femoral lock punches are made. Attach a quick-connect handle to a stemless trial one size below the femoral component size and place on the cut tibia to assess coverage. As needed, additional sizes should be template using the stemless trials. Once the appropriate size is determined, pin the medial size of the selected stemless trial with a short-headed pin.

Table 1: Walk, stairs, and total pain score for CS shows more score which is significantly more which indicate that CS surgery gives more functional result

Category	Group	Number of patients	Mean±SD	*P* value
Walk	CS	15	31.00±2.070	0.013
	CR	5	34.00±2.236	
Stairs	CS	15	11.00±2.070	0.013
	CR	5	14.00±2.236	
Total pain score	CS	15	42.00±4.140	0.013
	CR	5	48.00±4.472	

CS: Cruciate sacrificing, CR: Cruciate retaining

Table 2: Total knee score analyzed for CS and CR revealed that highly significant total knee score is for CR

TKS	Type	*n*	Mean±SD	*P* value
	CS	15	85.80±5.267	0.004
	CR	5	75.00±6.124	

CS: Cruciate sacrificing, CR: Cruciate retaining

RESULTS

All the 20 cases which had regular follow-up were taken into the study, and the average follow-up was from a minimum of 3 months to 18 months. We had the following observations: and in the rest, it was sacrificed. The functional outcome between the posterior CR and the cruciate sacrificing (CS) groups were compared using the American knee society scoring and the FKS and WOMAC questionnaire and the following observations were made.

Overall all the patients, in both the groups, had great improvement in the knee scores. The pain score (including stair climbing) in the posterior CS was on average 42.6 (out of 50) and that of CR group was 37. Stair climbing score was 11.3 (out of 15) and 9 in the PCL sacrificing and retaining groups, respectively, as compared to the pre-operative score of 4.6 and 5 (Table 1).

The mean range of movements in the CS and CR groups had a great improvement with post-operative scores 19.5 (max 25) and 18.4 in PCL sacrificing and retaining groups, respectively. The overall average knee score was 85.8 for posterior CS and 75.6 for the CR patients as compared to the pre-operative score of 43.4 and 38 (Table 2). FKS was 99.6 and 91.6 for CS and CR groups, respectively. The pre-operative FKS was 37.8 and 38 in these groups. The WOMAC score also showed a marked improvement

from 66.3 to 24.6 in CS groups and 27.4 for CS and CR, respectively.

DISCUSSION

Analyzing the total knee scores, the average knee society score for the CS group was 85.80 and that of CR group was 75.60 and statistical analysis revealed a significant difference in the *P* value in favor of CS prosthesis signifying that CS prosthesis has better functional outcome. Total knee score in a study conducted by Bolanos *et al.*, was 84 and 76 for CS and CR groups, respectively, which shows comparable results.[5]

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. On the comparison between the two groups, in those patients in whom the cruciate ligament was sacrificed had an average knee score of 85.8 and a FKS of 99.6, whereas in whom the PCL was retained the knee score was 75.6 and functional score was 91.6. A similar prospective study conducted by Dorr *et al.*, in 1998, has similar results.[6,7]

We were able to achieve a flexion of 100-110° in all our patients, and statistically, there was no much difference between CR and CS groups. The range of motion in a study conducted by Becker *et al.*, in 1991, revealed similar flexion results in both studies. The pain score showed a marked improvement in all the patients with an average of 42.6 in CS group as compared to 37 in CR group. Statistical analysis revealed a significant difference in *P* value for all the variables of pain score (walking and climbing) which was in favor of the CS group signifying that they had a better improvement in pain score.[8]

The functional knee society score also showed a marked improvement in all patients, for CS group, FKS was 99.6, and for CR group, it was 91.6. Statistically, there was no significant difference. The WOMAC score also showed a marked improvement. In CS groups, it was 24.6; in CR groups, it was 27.4. Statistical analysis showed a highly significant difference in favor of CS prosthesis. WOMAC scoring in an international study by Borque *et al.* showed WOMAC score for 25 and 28.2 for CS and CR, respectively, which are comparable.[7]

CONCLUSION

Total knee arthroplasty in patients in whom PCL was sacrificed was found to have a better functional outcome as compared to the retaining group, which can be mainly attributed to the persistence of flexion deformity in CR group. In Indian scenario here knee replacement is done at a late stage of OA, sacrificing the contracted PCL has better outcomes as compared to retaining it.

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