

A CLINICAL STUDY TO COMPARE THE OUTCOMES OF CRUCIATE RETAINING AND POSTERIOR STABILIZED TOTAL KNEE ARTHROPLASTY AMONG PATIENTS OPERATED AT A TERTIARY CARE HOSPITAL OF BIHAR

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ABSTRACT

Background: The purpose of the present study was to directly compare clinical and radiological outcomes, and complications of two groups of patients who received cruciate-retaining or posterior-stabilized implant and provide guidance to surgeon on selecting implant for particular patient. **Materials and Methods:** The current study was prospective in nature. It included a total of 24 study participants, who underwent primary total knee arthroplasty in the dept. of orthopedics at Darbhanga Medical College and Hospital. Informed written consent was taken from all patients. Cases were divided in two groups depending upon type of implantation they received. The criteria for cruciate ligament retention were structurally intact PCL, fixed flexion deformity of <20°, varus deformity of <20° and valgus deformity of <20°. **Results:** A total of 24 patients were included in the study and they were divided in two groups, CR group and PS group equally. In CR group, pre-op mean clinical and functional knee society score was 46.1 and 35.4 respectively. Average ROM observed was 91.5. In PS group, pre-op mean knee society score was 47.3 and 36.5 (clinical/functional) respectively. Observed mean ROM was 96.2°. Post-op 12 weeks follow-up, mean ROM in CR and PS joint was 118.3° and 121.4° respectively. The knee range of motion improved to 121.5 and 126.3 at final follow up at the end of 2 years and clinical/functional knee society score corrected to 92.5/88.5 and 94.6/93.4 in CR and PS group respectively. **Conclusion:** In our study mean knee society score (clinical/ functional) at 2-year follow-up was 94.6/ 93.4 for PS joint and 92.5/88.5 for CR joint. So, there was no significant difference functional outcome as far as CR or PS knees concerned (p value 0.43 and 0.51 respectively) All patients had good functional ROM at follow-up comparing both system PS joints had significant improvement in early ROM compare to CR joints (p=0.01).

INTRODUCTION

Total knee arthroplasty is terminal and effective available surgical treatment for arthritis of knee joint. Survivorship of cemented TKA ranges from 91%-99% over 10 years and 91%-96% over 15 years. Many authors have now reported long-term survivorships of well over 75% at 15- to 20-year follow-up. Numerous implant designs have been developed to improve the durability and function of these procedures.^[1-3] However, there has been controversy regarding techniques. The debate regarding the superiority of cruciate retaining or posterior stabilized design stated right since the very

inception of the two designs. Cruciate retaining techniques preserves posterior cruciate ligament. This design has advantages of bone preservation, increased proprioception, and reduced shear stress at fixation interface; near normal knee kinematics and greater stabilization of the prosthesis and more effective femoral roll back (PCL preventing anterior translation of the femur on the tibia). Posterior-stabilized implants have got a polyethylene post and femoral cam to replace the role of the PCL.^[4-6] during extension post and cam interact to prevent anterior translation of the femur on the tibia, while allowing femoral rollback during flexion. Potential advantages of these designs include a less

technically demanding procedure, a more stable component interface, predicted femoral rollback and increased range of motion.^[7-11] Recent studies have shown high short- and midterm success rates of both designs, but there is no consensus about superiority of one design over another.^[12-16] The purpose of the present study was to directly compare clinical and radiological outcomes, and complications of two groups of patients who received cruciate-retaining or posterior-stabilized implant and provide guidance to surgeon on selecting implant for particular patient.

MATERIALS AND METHODS

The current study was prospective in nature. It included a total of 24 study participants, who underwent primary total knee arthroplasty in the dept. of orthopedics at Darbhanga Medical College and Hospital. Patients with osteoarthritis, rheumatoid arthritis and post traumatic arthritis of knee, who required total knee arthroplasty, were included in study. Patients who underwent revision knee arthroplasty and who lost follow-up were excluded from study. Informed written consent was taken from all patients. Cases were divided in two groups depending upon type of implantation they received. The criteria for cruciate ligament retention were structurally intact PCL, fixed flexion deformity of <20°, varus deformity of <20° and valgus deformity of <20°.

Pre-operatively, patients were clinically and radiologically evaluated. Clinical evaluation involved history, thorough examination, BMI (Body mass index) calculation and knee society score.^[17] Radiological evaluation done on standing weight bearing antero-posterior x-ray and lateral x-ray (knee 90 flexed). Patients were operated in standard arthroplasty operative setup. All Surgeries done using midline anterior skin incision followed by medial parapatellar arthrotomy.^[18,19] Femoral and tibial cuts taken with help of intra-medullary and extramedullary jig respectively. Negative suction drain was kept for 24 hours in all patients. Physiotherapy was started from 1st postoperative day. Full weight bearing walking with support started from 2nd post- op day and stair climbing was allowed from 7th post-op day. All patients were

discharged on 5th or 6th post op day. Physiotherapy was advised for 2-3 weeks. Stitches were removed on 14th post-op day. After that support gradually weaned off over period of 2 weeks. All patients reevaluated clinically, radio logically (as it was done preoperatively) and for complications after 3 months, 6months 1year and at 6 monthly intervals thereafter. Data was recorded and was analyzed.

RESULTS

A total of 24 patients were included in the study and they were divided in two groups, CR group and PS group equally. The patients were matched for the age, sex and degree of preoperative deformity. The mean age of the patients in both the groups was comparable and statistically insignificant. The pre-operative baseline characteristics have been shown in [Table 1].

In CR group, pre-op mean clinical and functional knee society score was 46.1 and 35.4 respectively. Average ROM observed was 91.5. In PS group, pre-op mean knee society score was 47.3 and 36.5 (clinical/functional) respectively. Observed mean ROM was 96.2° Post-op 12 weeks follow-up, mean ROM in CR and PS joint was 118.3° and 121.4° respectively. The knee range of motion improved to 121.5 and 126.3 at final follow up at the end of 2 years and clinical/functional knee society score corrected to 92.5/88.5 and 94.6/93.4 in CR and PS group respectively [Table 2]. No statistically significant differences were found between Posterior stabilized and PCL-retaining groups when Knee society clinical scores, function scores, and flexion arc were evaluated.

On radiological evaluation 22 of total 24 cases had complete loss the joint space. Average surgical time was 63.4±7.3 min and average hospital stay was 6.2 days. Pre-operatively and post-operatively in all cases patella position was normal. Out of 24 patients, 2 patients developed complications; one patient presented at 9th post op with superficial infection which was managed with removal of infected suture material followed by regular dressing along with oral antibiotic. Another patient presented at 12th day with periprosthetic undisplaced supra-condylar femur fracture which was treated with above knee plaster.

Table 1: A Comparison of Demographic and Pre-Operative Findings of the Patients from Both the Groups

	CR Group N=12	PS Group N=12
Mean age (years)	59.8 ± 10.6	62.8 ± 9.6
Range of age (Max-min)	33	36
Gender (Male)	4	5
Side affected (Right)	7	8
Mean BMI (kg/m ²)	28.8 ± 5.7	29.4 ± 5.2
Diagnosis		
Osteoarthritis	8	9
Rheumatoid arthritis	2	1
Pseudo out	1	1
Post-traumatic osteoarthritis	1	1
Pre-operative alignment		
Varus	8	8
Valgus	2	3

Neutral coronal	2	1
Co-morbidity		
Hypertension	9	10
Type II DM	6	5
Thyroid disorders	3	2

Table 2: A Compare of the Clinical Scores of the Patients from Both the Groups

	CR Group N=12	PS Group N=12
ROM		
Pre-operative	91.5	96.2
2-year post-operative	121.5	126.3
Clinical score		
Pre-operative	46.1	47.3
2-year post-operative	92.5	94.6
Functional score		
Pre-operative	35.4	36.5
2-year post-operative	88.5	93.4

DISCUSSION

In our study mean knee society score (clinical/functional) at 2-year follow-up was 94.6/ 93.4 for PS joint and 92.5/88.5 for CR joint. So, there was no significant difference functional outcome as far as CR or PS knees concerned (p value 0.43 and 0.51 respectively) In 3 cases done with CR joint KSS was below 80 at 2 year follow-up, among them all the 3 had extremely low preop KSS. In two PS knee KSS was below 80. One had low preop score and one had developed post-op infection. All patients had good functional ROM at follow-up comparing both system PS joints had significant improvement in early ROM compare to CR joints (p=0.01).

Several other studies have directly compared the two prosthetic designs, with mixed results. Maruyama et al did prospective, randomized comparison of posterior cruciate-retaining (PCR) and posterior stabilized (PS) total knee arthroplasties (TKAs) conducted in 20 patients who underwent bilateral TKAs for osteoarthritis (One knee was implanted with a PCR TKA, and a contralateral knee with a PS TKA). Patients had a clinical and radiographic evaluation at a mean of 31.7 months for PCR TKAs and 30.6 months for PS TKAs postoperatively and there were no significant differences between the PCR and PS TKAs in postoperative knee scores. However, postoperative improvement in range of motion was significantly superior in the PS group (131° versus 122°, p<0.05).^[20] Yoshiya et al performed in vivo kinematic analysis of 20 patients who underwent bilateral total knee arthroplasties with a posterior-stabilized implant in one knee and a cruciate-retaining implant in the other. In the PCR TKA, an anterior femoral translation from 30 degrees to 60 degrees of flexion was observed in the weight-bearing condition indicating that the PCL might not be functioning while flexion kinematics for the PS TKA was more stable characterized by the maintenance of a constant contact position under weight-bearing conditions and posterior femoral rollback in passive flexion. They also found a greater range of motion of the knees that had posterior- stabilized implants (131°±12° versus

121°±16°).^[21] Bolanos et al examined fourteen patients with a posterior- stabilized prosthesis in one knee and a posterior cruciate- retaining prosthesis in the contralateral knee at mean 98 months followup time Hospital for Special Surgery (HSS) knee scale were evaluated by isokinetic muscle testing and comprehensive gait analysis. At mean 98 months' time no significant differences were found between the cruciate-retaining and the posteriorstabilized knees with regard to gait parameters, knee range of motion, and electromyography waveforms during level walking and stair climbing. Both knee prosthesis performed equally well.^[22] Tanzer et al examined two groups of 20 patients who were randomized to receive cruciate-retaining or posterior-stabilized implants, they found no differences in Knee Society or radiographic scores at the two-year follow-up.^[23]

CONCLUSION

In our study mean knee society score (clinical/functional) at 2-year follow-up was 94.6/ 93.4 for PS joint and 92.5/88.5 for CR joint. So, there was no significant difference functional outcome as far as CR or PS knees concerned (p value 0.43 and 0.51 respectively) In 3 cases done with CR joint KSS was below 80 at 2 year follow-up, among them all the 3 had extremely low preop KSS. In two PS knee KSS was below 80. One had low preop score and one had developed post-op infection. All patients had good functional ROM at follow-up comparing both system PS joints had significant improvement in early ROM compare to CR joints (p=0.01).

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