



International Journal of Orthopaedics Sciences

ISSN: 2395-1958
IJOS 2019; 5(2): 873-880
© 2019 IJOS
www.orthopaper.com
Received: 04-02-2019
Accepted: 08-03-2019

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Clinical and functional outcome of posterior cruciate ligament retaining total knee arthroplasty

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DOI: <https://doi.org/10.22271/ortho.2019.v5.i2m.102>

Abstract

Introduction: Posterior Cruciate Ligament (PCL) retention achieves an increased potential range of motion by effective femoral roll back and a relatively flat tibial articular surface in Total Knee Arthroplasty.

Objective: To study the clinical and functional outcome of patients who undergo posterior cruciate ligament (PCL) retaining total knee arthroplasty.

Methods: The purpose was to determine the clinical and functional outcome during the acute and midterm (One year) follow up after posterior cruciate ligament retaining total knee arthroplasty (CR TKA). Thirty patients scheduled for CR TKR were evaluated preoperatively, 1 month, 3 months, 6 months and 12 months postoperatively using the knee society clinical and functional scores.

Results: The mean pre-operative knee society clinical and functional scores of the 30 cases were 36.5 (Ranging from 20 to 64) and 31.8 respectively. The mean knee society clinical score at the 1st follow up was 76.5, at the 2nd follow up was 83.5, 3rd follow up was 88.6 and 4th follow up was 92.4. The mean knee society functional score at the 1st follow up was 72.5.5, at the 2nd follow up was 80.5, 3rd follow up was 87.5 and 4th follow up was 90.6.

Conclusion: We found out that twenty nine out of thirty patients undergoing TKR had excellent clinical and functional scores; one patient had good functional scores at the end of one year. More than 90% of patients in our study had excellent functional scores at the end of one year. Posterior cruciate ligament retaining total knee arthroplasty is a good surgical option for osteoarthritis of knee.

Keywords: Posterior cruciate ligament, cruciate retaining total knee arthroplasty, knee society score

1. Introduction

Osteoarthritis of the knee is a common clinical problem that affects elderly and few young individuals and is associated with symptoms like pain, stiffness and limitation of activity and associated clinical signs like swelling, effusion, crepitus, impingement, instability and malalignment. Treatment options include rest, analgesics, radiotherapy, molecular remodeling and for end stage arthritis, the ultimate modality being total knee arthroplasty (TKA). TKA is an effective surgical modality that reduces pain, improves patient's quality of life, and increases functional capability.

Posterior Cruciate Ligament (PCL) retention achieves an increased potential range of motion by effective femoral roll back and a relatively flat tibial articular surface.

Kinematics in a cruciate-retaining total knee arthroplasty are not directed by the prosthesis but rather by the ligaments and dynamic forces about the knee and have been shown to facilitate long term survivorship of knee replacements with a very low incidence of aseptic loosening.

We believe that retaining the PCL is possible in almost all TKAs and that it depends to a large extent on surgical technique to sufficiently "balance" the kinematics of the knee.

As there is a modern day controversy about the use of PCL-retaining versus PCL substituting TKA and many studies are not available to assess the functional outcome of PCL-retaining TKA, our aim is to carry a study on functional outcome of the posterior cruciate ligament-retaining Total Knee arthroplasty in end stage arthritis.

2. Aim of the study

To study the clinical and functional outcome of patients who undergo posterior cruciate ligament (PCL) retaining total knee arthroplasty.

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3. Materials and Methods

Objectives

To assess the improvement in Functional outcome post operatively based on knee society score as under:

- Pain relief
- Stability of the joint
- Mobility of the joint
- To assess the correction of deformities

Study design

Prospective study

Sample size

A sample size of 30 patients as study subjects is considered

Study setting

Patients are to be mainly assessed **objectively** as under the following headings:

- Knee pain
- Total range of movement
- Varus and Valgus alignments
- Stability antero-posteriorly and medio-laterally

Patients are to be mainly assessed functionally as under the following headings:

- Walking
- Climbing stairs
- Walking aids used (or) not

Study subjects

Patients to be assessed were chosen as study subjects conforming to the following.

Inclusion criteria

- Varus deformity upto 25 degree
- Valgus deformity upto 15 degree
- FFD not more than 15 degree
- Degenerative arthritis

Patients to be assessed were chosen as study subjects conforming to the following

Exclusion criteria

- Neuropathic joints
- Rheumatoid arthritis
- Knees with recurvatum deformity
- Revision TKA / post HTO / post Patellectomy

Study period

The study period considered is a period of two years; beginning in January of 2016 and stretching to December of 2017.

Follow Up period

The follow up of the study subject patients is to be done post operation at:

- 1 month post-surgery
- 3 months post-surgery
- 6 months post-surgery
- 1 year post surgery

The minimum follow up period for any test subject to be considered is 6 months

Outcome

Upto 2 years

Analysis

The analysis is under the two main headings objective scoring and functional scoring as follow below.

Objective scoring

Pain points	
No pain reported	50
Mild or occasional	45
While climbing stairs only	40
While climbing stairs and walking	30
Moderate	
Occasional	20
Continual	10
Severe	0
Range of motion	
5° = 1 point	25
Anteroposterior Stability (Maximum movement)	
<5 mm	10
5-10 mm	5
10 mm	0
Mediolateral Stability (Maximum movement)	
<5°	15
6° -9°	10
10° -14°	5
15°	0
Flexion contracture	
5° -10°	-2
10° -15°	-5
16° -20°	-10
>20	-15
Extension lag	
<10° -5	-5
10° -20°	-10
>20°	-15
Alignment	
0° -4°	3 points each degree
5° -10°	0
11° -15°	3 points each degree

Total: 100 Functional Scoring

Walking	
Unlimited	40
>10 blocks	30
5-10 blocks	20
<5 blocks	10
Housebound	0
Stair climbing	
Normal unassisted upward & downward	50
Normal unassisted upward & assisted with railing downward	40
Assisted with railing both upward & downward	30
Assisted with railing both upward & unable to climb downward	15
Unable to climb either upward or downward	0
Functional deductions	
Cane	5
Two canes	10
Crutches or walker	20

Total: 100

(If total is a minus number, score is 0)

Methodology

After receiving the institutional research committee approval, 30 patients who were consenting to take part in the study were considered for the study. All the patients were evaluated

clinically and radio logically pre operatively using knee society score and standing three joint x-rays antero-posterior and lateral views. Antibiotics were given pre operatively (Cefuroxime 1.5 g IV half an hour before the start of the procedure) and continued for the next 72 hours. A total of 6 doses were given to prevent infection post operatively, after which oral antibiotics were continued for 5 days. All the procedures were done under sub- arachnoid with epidural blockade. Non weight bearing mobilization was started as soon as the patient tolerates. X ray was taken after 72 hours and patient allowed to bear weight using quadrangular walker.^{1st} Wound inspection was usually done after 48 hours and suture removal after 10 days. Patients were discharged after suture removal. The patients were followed up at 4 weeks, 3 months, 6 months and 1 year and knee society score charting and clinical assessment to look for any complications were done in each follow up. The improvement or deterioration in the functional outcome if any as assessed by the knee society score were documented and analyzed.

Surgical procedure

Positioning of the patient

Patients were operated under spinal with epidural anesthesia in supine position with the knee in 90 degree of flexion

Sterile preparation of the Leg

Any shaving of hair around the area of the planned incision is done just prior to sterile preparation of the leg. The knee incision is drawn with an indelible marking pen prior to the skin prep. An impervious stockinette is then rolled from the foot to the level of the thigh tourniquet. A so-called "cling drape" completes the draping. The stockinette is incised vertically to expose the drawn skin incision.

The tourniquet

A tourniquet was used for all total knee arthroplasties. The tourniquet pressure utilized is 300 mmHg in most cases. Maximum tourniquet time is 90 minutes with a 10-minute interval before re-inflation is considered. The first dose of prophylactic antibiotics is given at least 10 minutes before tourniquet inflation.

The incision

The incision is drawn with the knee flexed prior to the surgical prep. A standard incision is straight, vertical, and approximately 15 cm long. It is centered proximally over the shaft of the femur, in its mid portion over the mid third of the patella and distally just medial to the tibial tubercle ^[1].

Medial parapatellar arthrotomy

A medial Parapatellar arthrotomy for all knees. At the superior pole of the patella, a soft tissue cuff is preserved to facilitate closure. At the tibial tubercle, a medial soft tissue cuff is carefully preserved for closure to the medial border of the patellar tendon.

Preparation of the tibia

Determining the amount of tibial resection

We prefer a measured resection technique based on the thickness of component to replace the resected tissue. For prosthesis with a composite thickness of 8 mm, 8 mm would be removed from the more prominent plateau, almost invariably the lateral side. This measurement would include any residual cartilage ^[3].

If a metal-backed component is being used, a composite

thickness as much as 9 mm may be required to allow for the minimum thickness of polyethylene required by the FDA.

Determining alignment of the tibial resection with extramedullary devices

Several maneuvers are helpful in increasing the accuracy of an extramedullary alignment device. Proximal and distal landmarks are readily available. Proximally, the resection guide ideally should be centered between the medial and lateral tibial cortices. The distal anatomic landmark for an extramedullary device is the readily palpable sharp anterior crest of the tibia ^[6].

Posterior tibial slope

Posterior tibial slope in the "normal" knee can be quite variable, anywhere between 0° and 15°. Generally we use approximately 5° and achieve this using an external alignment device by moving the ankle adjustment anteriorly away from the ankle ^[5].

Protecting the PCL

There are several ways to protect the PCL during the resection. One is to create a small slot in front of the PCL using an oscillating saw and then insert a 1-cm-wide osteotome into the slot to protect the posterior tissues from the excursion of the oscillating saw. A second way is to preserve a wedge-shaped island of tibial spine in front of the ligament by outlining this with an oscillating saw or reciprocating saw. The preserved island can be denuded of soft tissue in situ with the oscillating saw and severed just in front of the PCL to be used as a bone plug to seal off the femur where the hole was made for the intramedullary femoral alignment device. The tibial surface is best exposed by placement of a Z-retractor or bent Hohmann retractor medially, a bent Hohmann laterally, and a forklike retractor posteriorly that straddles the PCL tibial insertion ^[7].

Sizing the tibia

Once the tibial resection has been completed, the tibia can be sized. The goal of sizing the tibia is to maximally cap the bone while avoiding significant tray overhang. Any overhang anterior to the mid-sagittal plane of the tibia can be symptomatic, causing a painful soft tissue inflammation.

Determining the rotational alignment of the tibial component

A way to align the tibial rotation is to base it on the tibial tubercle. The most commonly used landmark is the junction between the medial and central thirds of the tubercle.

In a PCL-retaining technique, the tibial trial component must always be placed first. The initial thickness of tibial trial chosen is the thinnest composite available for the system unless it is obvious that the flexion and extension spaces will require a thicker size.

Flexion stability is assessed first. If pullout is not possible, the flexion gap is not too loose and now must be assessed to see if it is too tight. This is done by observing lift-off of the tray from the anterior tibial cortex when the knee is flexed between 80° and 100°.

This lift-off is the result of a tight PCL forcing the femur posteriorly so that it impinges on the posterior lip of the tibial component, pushing the tray down in back with corresponding lift-off in front ^[5].

Adjusting flexion/extension gaps

After the trial components are inserted, the flexion and

extension gaps are assessed starting with the thinnest composite thickness of tibial component.

The easier mismatch to fix is when the extension gap is tighter than the flexion gap. This is treated by increasing the distal femoral resection. The more difficult mismatch to resolve is when the flexion gap is tighter than the extension gap and the PCL is being preserved. There are four ways to deal with a tighter flexion gap.

1. Increase the posterior slope of the tibial cut but to avoid a posterior slope greater than 10°.
2. The second is to release the PCL.
3. The third is to downsize the femoral component to one with a smaller anteroposterior dimension as long as notching of the anterior femoral cortex is avoided.
4. The fourth method is to stabilize the flexion gap with the appropriate tibial resection and thickness of tibial component and treat the lax extension gap by cementing the femoral component proud of the bony cuts to a level that achieves extension stability ^[10].

Preparation of the femur

To prepare the femur, it is important to first define the anatomy of the intercondylar notch and expose and define the PCL origin. The medullary canal of the femur is entered approximately 1 cm above the origin of the PCL and a few millimeters medial to the true center of the intercondylar notch. One way to define this is to draw the Whiteside line down the deepest part of the trochlear sulcus and mark the entry point 1 cm above the top of the intercondylar notch and several mm medial to the Whiteside line ^[2].

Distal femoral resection

In a PCL-preserving technique, the goal should be to restore the femoral joint line as precisely as possible and avoid a knee that is tighter in flexion than in extension. After initial preparation of both the femur and tibia, if the knee is tighter in extension than in flexion, the distal femur can be revisited for 2 more millimeters of resection. Excessive distal femoral resection is better tolerated in a PCL-substituting technique. Removing the PCL enlarges the flexion gap and allows the thicker polyethylene required to stabilize the knee in flexion also to be tolerated in extension.

Determining the rotational alignment of the femoral component

After the femoral component has been sized, its proper rotational alignment must be determined. At least four methods are popularly used to determine femoral component rotation. These include perpendicular to the Whiteside line (The trans-sulcus axis), the trans-epicondylar axis, 3° of external rotation off the posterior condyles and rotational alignment that yields flexion gap symmetry ^[2].

Completing the femoral cuts

Trochlear resection

The anterior or trochlear cut is made first. The main concern with this cut is to be certain to avoid notching the anterior cortex. If there is ever concern that the trochlear resection might be excessive, the “pre-cut” of the trochlea will help determine this. If it appears that the planned trochlear resection would, in fact, notch the anterior cortex, the femur should be recut in a few degrees of flexion or the pinholes for the cutting jig should be displaced the appropriate distance anteriorly by means of the navicular gouge technique.

Posterior condylar resection

The posterior condylar cuts are next completed. The medial collateral ligament is protected during the medial posterior condylar resection by a spike retractor.

Chamfer cuts

The chamfer cuts are next completed.

Final preparation of the femur

Final preparation of the femur is accomplished after tibial preparation when there is greater posterior exposure. The trial femoral component is applied for the first time. Once the trial femoral component is seated, it must be properly positioned in the medial-lateral dimension.

After the femoral component has been moved laterally to be flush with the lateral cortex, any remaining peripheral osteophytes are removed. It is most important to achieve this at the level of the origin of the popliteus tendon to prevent a possible popliteus impingement syndrome.

Assessment of patellar tracking

If the patella tracks congruently when the knee is flexed, with good contact between the medial facet of the patella and the medial aspect of the trochlear groove, no lateral release need be contemplated. However, if the patella dislocates, partially dislocates, or tilts laterally, a lateral release may be indicated. If tracking is now congruent and the tension on the suture is not excessive, no lateral release is necessary.

Final preparation prior to cementing of components

All bone surfaces are now cleansed with pulsatile lavage. If there is sclerotic medial tibial bone (As is common in a preoperatively varus knee), use a punch or drill to make multiple small holes for cement penetration.

Cementing components

The tibial component is cemented first. Cement is placed into the metaphysis for the stem or keel of the prosthesis and then onto the tibial plateau. The component is tapped into position. Any extruded cement is removed.

Next, the femoral component is cemented. Cement is placed on all the femoral surfaces except only a thin film is smeared and pressurized onto the posterior condylar surfaces. Cement is also placed into the recesses of the prosthetic posterior condyles and chamfers. With this technique, any extruded cement will come forward and can be removed. After the femoral component is partially impacted into position, the trial modular insert is placed into the tray and femoral impaction is completed. Finally, the knee is brought to full extension to pressurize the bone-cement interface during polymerization.

After full polymerization, the knee is flexed, the tourniquet is deflated, and a second dose of antibiotic is administered.

The trial insert is then removed. The entire periphery of both the femoral and tibial components is checked for any additional extruded cement. The femur is lifted with a bone hook, and the posterior condyles are inspected and palpated for cement extrusion. Finally, the real insert is placed.

Draining and closing the wound

Place a small suction drain laterally and bring it out through separate stab wounds. Leave about 5 cm of the drain inside the knee. The drains are always removed the morning after surgery.

The capsule is closed with interrupted No. 1 monofilament resorbable sutures.

Immediately after surgery, the knee is placed in a knee immobilizer to minimize the chance of developing an early flexion contracture and protect those patients who have received a 24-hour femoral nerve block.

Observations

Pre-Op photos



Fig 1: Alignment



Fig 2: Flexion



Fig 3: Extension

Intra-op photos



Fig 4: Sterile draping



Fig 5: Medialpara – patellar approach



Fig 6: Femoral and tibial cuts preserving the PCL



Fig 7: post op radiograph

Results

Patient Characteristics

Age distribution

Out of the 30 patients, 12 patients were less than 60 years old,

15 patients were between 60 and 69 years and 3 were above 70 years.

Table 1: AGE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<60	12	40.0	40.0	40.0
	60-69	15	50.0	50.0	90.0
	>=70	3	10.0	10.0	100.0
	Total	30	100.0	100.0	

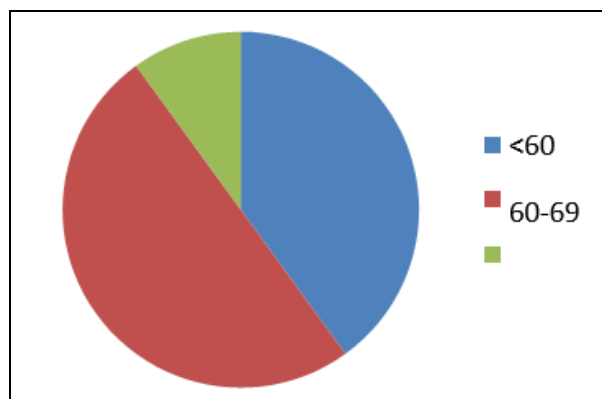


Chart 1: AGE

Sex distribution

Out of 30 patients, 8 (26.7%) were males 22(73.3%) were females.

Table 2: SEX

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	8	26.7	26.7	26.7
	Female	22	73.3	73.3	100.0
	Total	30	100.0	100.0	

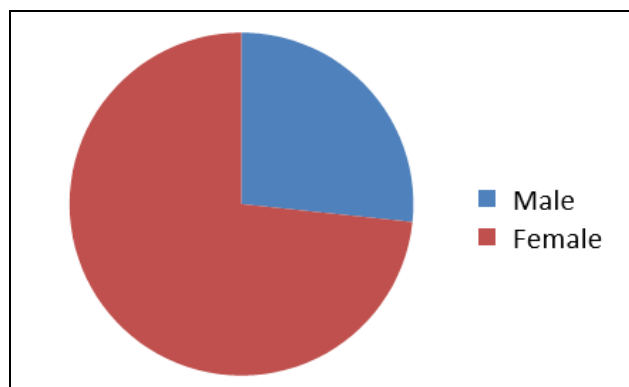


Chart 2: SEX

Deformity

Out of 30 patients, 24 patients had genu varum and 6 patients had genu valgum.

Table 3: Deformity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	varus	24	80.0	80.0	80.0
	valgus	6	20.0	20.0	100.0
	Total	30	100.0	100.0	

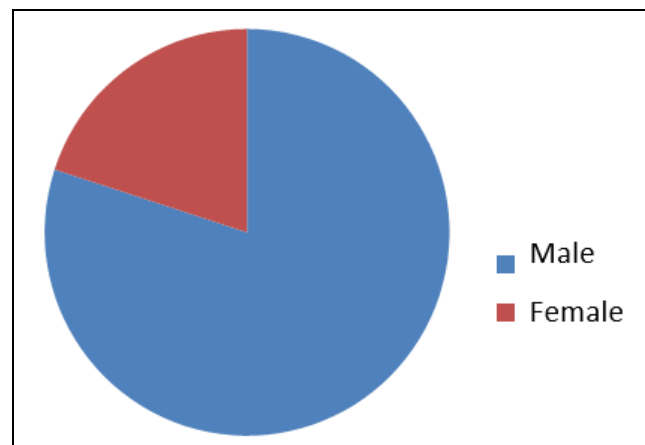


Chart 3: Deformity

Side

Out of 30 patients, 14 patients (46.7%) had their right knees operated and 14 (46.7%) had their left knees operated and 2 cases were operated bilaterally.

Table 4: SIDE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Right	14	46.7	46.7	46.7
	Left	14	46.7	46.7	93.3
	Bilateral	2	6.7	6.7	100.0
	Total	30	100.0	100.0	

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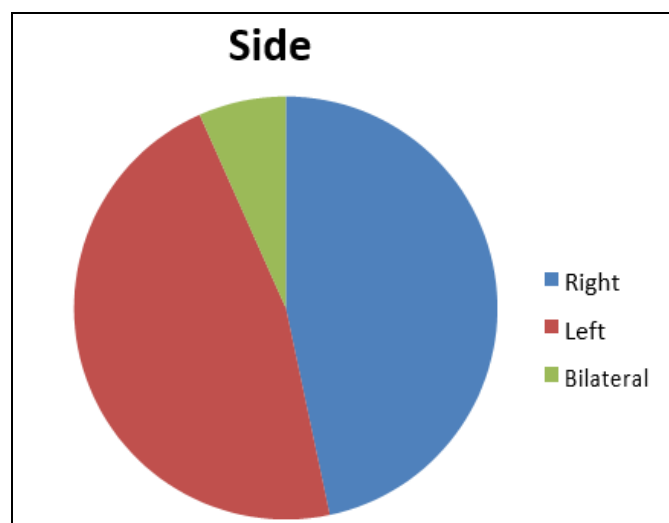


Chart 4: Knee society score

Table 5: KSS pre op

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	poor	30	100.0	100.0	100.0

Table 6: 1st follow up

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	excellent	19	63.3	63.3	63.3
	good	10	33.3	33.3	96.7
	fair	1	3.3	3.3	100.0
	Total	30	100.0	100.0	

Table 7: 2nd follow up

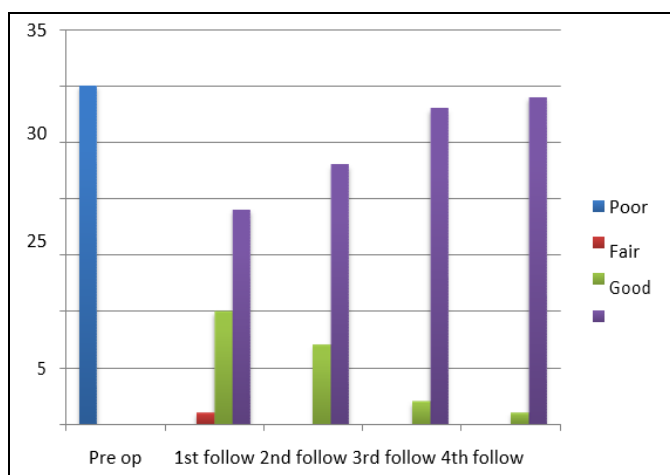
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	excellent	23	76.7	76.7	76.7
	good	7	23.3	23.3	100.0
	Total	30	100.0	100.0	

Table 8: 3rd follow up

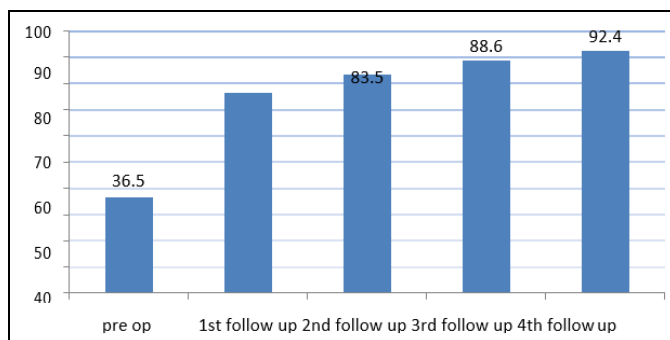
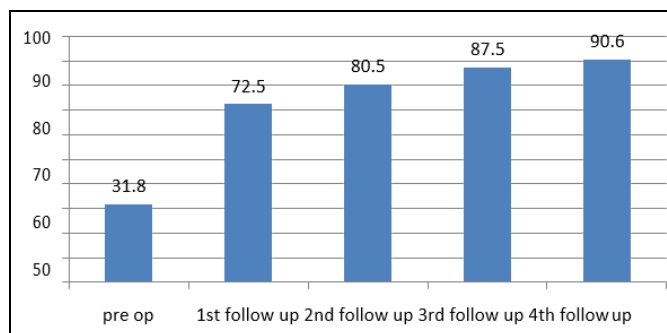
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	excellent	28	93.3	93.3	93.3
	good	2	6.7	6.7	100.0
	Total	30	100.0	100.0	

Table 9: 4th follow up

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Excellent	29	96.7	96.7	96.7
	good	1	3.3	3.3	100.0
	Total	30	100.0	100.0	

**Chart 5:** Knee Society score**Knee society score**

The mean pre- operative knee society clinical and functional scores of the 30 cases was 36.5 (ranging from 20 to 64) and 31.8 respectively. The mean knee society clinical score at the 1st follow up was 76.5, at the 2nd follow up was 83.5, 3rd follow up was 88.6 and 4th follow up was 92.4. The mean knee society functional score at the 1st follow up was 72.5, at the 2nd follow up was 80.5, 3rd follow up was 87.5 and 4th follow up was 90.6.

**Chart 6:** Mean Knee society clinical score**Chart 7:** Mean knee society functional scores

The study group consisted of 30 patients with a mean follow up of 1 year. There were 8 males (26.7%), and 22 females (73.3%). Majority of the patients belonged to the 60 – 69 age group (50%). There was no difference in the laterality. There were 24 cases of genu varum (80%) and 6 cases of genu valgum (20%) in the study.

The mean pre- operative knee society clinical and functional scores of the 30 cases was 36.5 (ranging from 20 to 64) and 31.8 respectively. The mean knee society clinical score at the 1st follow up was 76.5, at the 2nd follow up was 83.5, 3rd follow up was 88.6 and 4th follow up was 92.4. The mean knee society functional score at the 1st follow up was 72.5, at the 2nd follow up was 80.5, 3rd follow up was 87.5 and 4th follow up was 90.6.

The difference between pre op scores and the 1st follow up scores were significant (p value<0.01).

There were no serious complications encountered during the study. None of the patients complained of disabling pain during the follow up.

7. Discussion

Total Knee Arthroplasty improves the functional ability of the patient and the ability of the patient to get back to pre-disease state. Total knee replacement arthroplasty is successful method in pain relief, correction of deformities, improve mobility of the joint and achieve stability.

Cruciate retaining preserves more bone and hence revisions are easier. This is particularly important in the Indian scenario where the knees are relatively small and our aging population being increasingly osteoporotic.

PCL retaining is avoided in recurvatum knees as the PCL is lax.

PCL tightness when minimal, ligament balancing using a pie crust technique of tight fibres is done. In cases of uniform tightness of the PCL, elevation of the PCL insertion along with a bone plug is done. After insertion of implant, PCL tightness is reassessed by the Pull out and Lift off test.

The main aim in the CR technique is to preserve the bone and the implant is a non constrained type, hence enhancing the longevity of the implant.

We have compared the results of this study with several studies worldwide.

1. Shoji H *et al.* ^[11]. Cruciate retained and excised total knee arthroplasty, a functional outcome.
2. Dejour D *et al.* ^[12]. Laxity in posterior cruciate sparing and posterior stabilized total knee prosthesis.
3. Straw R *et al.* ^[13]. Posterior cruciate ligament at total knee replacement. Essential, beneficial or a hindrance?
4. Victor J, *et al.* ^[14]. Kinematics of posterior cruciate

ligament retaining and substituting Total Knee Arthroplasty, a positive randomized outcome study.

5. Pagnano MW *et al.* ^[15]. Flexion instability after primary posterior cruciate retaining total knee arthroplasty.
6. Cormie MJ *et al.* ^[16]. Posterior Cruciate Ligament Removal Contributes to Abnormal Knee Motion During Posterior Stabilized Total Knee Arthroplasty.
7. Cater J *et al.* ^[17] Laxity after posterior cruciate ligament-retaining mobile bearing total knee arthroplasty.

Study group	Number of patients (n)	Follow up period
Shoji H <i>et al.</i> ,	331	2 years
Dejour D <i>et al</i>	140	2 years
Straw R <i>et al.</i> ,	190	5 years
Victor J, <i>et al</i>	200	7 years
Pagnano MW <i>et al.</i>	108 (216 knees)	10 years
Cormie MJ <i>et al.</i> ,	300	2 years
Cater J <i>et al</i>	50 (100 knees)	40 months

Shoji *et al.* revealed patients who ascended and descended stairs with one leg at a time tended to prefer the CR knee. The results of their study showed significant improvement in knee scores and functional scores in patients who received CR TKA. There was considerable improvement achieved in SF-12 functional survey including work performance and social life consistent with our study.

Dejour *et al* showed significant differences in mediolateral laxity between patients that underwent CR TKA and CS TKA favoring those that underwent CR TKA.

Limitations of the study

The study requires a longer follow up to confirm the functional outcome of the surgery in the long run.

8. Conclusion

We conducted a study to know the clinical and functional outcome of patients who undergo posterior cruciate ligament (PCL) retaining total knee arthroplasty. Thirty patients scheduled for CR TKR were evaluated preoperatively, 1 month, 3 months, 6 months and 12 months postoperatively using the knee society clinical and functional scores.

The mean pre- operative knee society clinical and functional scores of the 30 cases was 36.5 (Ranging from 20 to 64) and 31.8 respectively. The mean knee society clinical score at the 1st follow up was 76.5, at the 2nd follow up was 83.5, 3rd follow up was 88.6 and 4th follow up was 92.4. The mean knee society functional score at the 1st follow up was 72.5, at the 2nd follow up was 80.5, 3rd follow up was 87.5 and 4th follow up was 90.6.

We found out that twenty nine out of thirty patients undergoing TKR had excellent clinical and functional scores, one patient had good functional scores at the end of one year. More than 90% of patients in our study had excellent functional scores at the end of one year. Posterior cruciate ligament retaining total knee arthroplasty is a good surgical option for osteoarthritis of knee.

9. References

1. Yacoubian SV, Scott RD. Skin incision translation in total knee arthroplasty: the difference between flexion and extension. J Arthroplasty. 2007; 22(3):353-5.
2. Olcott CW, Scott RD. The Ranawat Award: femoral component rotation during total knee arthroplasty. Clin Orthop. 1999; 367:39-42.
3. Scott RD. Femoral and tibial component rotation in total knee arthroplasty: methods and consequences. Bone Joint

J. 2013; 95-B(11, A):140-3.

4. Barnes CL, Scott RD. Popliteus tendon dysfunction following total knee arthroplasty. J Arthroplasty. 1995; 10:543-545.
5. Huddleston JI, Scott RD, Wimberley DW. Determination of neutral tibial rotational alignment in rotating platform TKA. Clin. Orthop. 2005; 440:101-106.
6. Rispler DT, Kolettis GT, Scott RD. Tibial resection in total knee arthroplasty using external alignment instrumentation based on the true center of the ankle. J Orthop Tech. 1994; 2(2):63-67.
7. Scott RD, Chmell MJ. Balancing the Posterior Cruciate Ligament during Cruciate-Retaining Fixed and Mobile-Bearing Total Knee Arthroplasty. J Arthroplasty. 2008; 23:605-608.
8. Scott RD. Prosthetic replacement of the patellofemoral joint. Orthop Clin North Am 1979; 10:129-137.
9. Lee DC, Kim DH, Scott RD, Suthers K. Intraoperative flexion against gravity as an indication of ultimate range of motion in individual cases after total knee arthroplasty. J Arthroplasty. 1998; 13:500-503.
10. Lee DC, Kim DH, Scott RD, Suthers K. Intraoperative flexion against gravity as an indication of ultimate range of motion in individual cases after total knee arthroplasty. J Arthroplasty. 1998; 13:500-503.
11. Shoji H, Wolf A, Packard S, Yoshinos. Cruciate retained and excised total knee arthroplasty. Clin Orthop Rel Res. 1994; 305:218-22.
12. Dejour D, Deschamps G, Garotta L, Dejour H. Laxity in posterior cruciate sparing and posterior stabilized total knee prosthesis. Clin Ortho 1999; 364:182-93.
13. Straw R, Kulkarni S, Attfield S, Wilton TJ. Posterior cruciate ligament at total knee replacement. Essential, beneficial or a hindrance? J Bone Joint Surg Br. 2003; 85:671-4.
14. Victor J, Banks S, Bellemans J. Kinematics of posterior cruciate ligament retaining and substituting Total Knee Arthroplasty, a positive randomized outcome study. J Bone Joint Surg (Br). 2005; 87-B:646-55.
15. Pagnano MW, Hanssen AD, Lewallen DG. Flexion instability after primary posterior cruciate retaining total knee arthroplasty. Clin Orthop Rel. Res. 1998; 356:39-46.
16. Cormie MJ, Siston RA, Giori NJ. Posterior Cruciate Ligament Removal Contributes to Abnormal Knee Motion During Posterior Stabilized Total Knee Arthroplasty. Journal of Orthopedic Research. 2008; 26(11):1494-99.
17. Cater J, Lerat JL, Testa R. Sagittal laxity after posterior cruciate ligament- retaining mobile-bearing total knee arthroplasty. J Arthroplasty. 2009; 24(5):710.