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Original Research Article

Clinical and functional outcome of total knee arthroplasty in osteoarthritic patients at a tertiary care center in Kerala: a prospective study

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ABSTRACT

Background: Osteoarthritis affects the knee joint more frequently than any other joint. Osteoarthritis is a chronic joint disease that affects the older age group, women more frequently, and is associated in 90% of cases with a varus deformity of the knee. The following study was conducted to evaluate the functional outcome of total knee arthroplasty in osteoarthritis using the knee society score.
Methods: The study was conducted in patients treated for osteoarthritis of the knee joint at Jubilee Mission Medical College and Research Institute, Thrissur, Kerala during the period from December 2019 to March 2022. Thirty patients diagnosed with osteoarthritis of the knee joint were taken into the study, all were undergone total knee arthroplasty. Patients were followed up at 4 weeks, 12 weeks, and 24 weeks.
Results: The sample consisted of thirty osteoarthritic patients with 8 males and 22 were females. The patients' ages ranged from 45-75 years. Among these 30 patients, 14 involved the right side, and 16 involved the left knee joint. The mean pre-operative knee clinical score was 36.93 which was improved to post-operative 84.70 following total knee arthroplasty. The mean pre-operative knee functional score was 16.83 which was improved to post-operative 71.17 following total knee arthroplasty. The outcome was rated as per knee society score. We got excellent results in 25 cases (83%), good in 3 (10%), and fair in 2 patients (7%) according to knee clinical score whereas 8 excellent (27%), 16 good (53%), 5 fair (17%) and 1 poor (3%) results were found according to knee functional score.
Conclusions: Total knee arthroplasty shows drastic improvement in the functional ability of the patient and the ability of the patient to get back to a pre-disease state, which is mainly because of pain-free joint movements, reflected by the improvement in the post-operative knee clinical score and knee functional score.

Keywords: Total knee arthroplasty, Osteoarthritis, Knee society score

INTRODUCTION

Primary knee osteoarthritis (OA) is the commonest articular disease in the older population.[1] It is a pandemic disease of global importance which leads to disability and negatively affects the daily activities of patients.[2] The disease is progressive and leads to angular deformity, recurrent swelling, stiffness, and pain.[3] Thus it is a leading cause of physical and functional disability and socioeconomic burden to the patient, family members, and community.[4]

The concept of modifying the articular surfaces for the improvement of knee joint function has gained attention since the 19th century. A variety of surgical techniques has developed from soft tissue interposition arthroplasty to resection arthroplasty to surface replacement arthroplasty. In surface replacement arthroplasty to address the complex

knee kinematics, different types of the prosthesis were developed. Total knee replacement (TKR) operation is a well-established and proven procedure to decrease pain and improve function in patients with debilitating pain due to end-stage arthritis of the knee joint.[5]

The aim of our study was to assess the clinical profiles and functional outcomes of total knee arthroplasty in osteoarthritic patients at department of orthopaedics, Jubilee mission medical college, Thrissur, Kerala. Thirty patients diagnosed with osteoarthritis of the knee joint were taken into the study, all were undergone total knee arthroplasty.

METHODS

Study design

The present research was a prospective observational study.

Study population

Population above the age of 45 years who satisfy the inclusion and exclusion criteria coming to the orthopedics department of Jubilee Mission Medical College, casualty and outpatient department (OPD) were selected consecutively in this study.

Inclusion criteria

Patients with moderate to severe pain, angular knee deformity, knee stiffness (extension lag, flexion contractures), and unilateral or bilateral knee involvement.

Exclusion criteria

Patients with active infection of the knee, revision arthroplasty, young patients (<45 years), vascular problems (deep vein thrombosis), and patients not consenting for consenting for study were excluded.

Study period

The study was conducted during the period from December 2019 to March 2022.

Study procedure

After approval from the institutional ethics committee, all patients who come under inclusion criteria will be included in the study. Once the patients agreed to participate, informed consent was taken and the subjects were then included in the study. A detailed history of all patients was taken. All patients were assessed clinically and functionally using the knee society score. The preoperative medical evaluation of all patients was done to prevent potential complications that can be life-threatening or limb-threatening. Any limb length discrepancies if present, were noted. The presence of any hip and foot deformities was assessed. The extensor mechanism was assessed for any quadriceps contractures. The knee deformities were examined for any fixed varus or valgus deformities or the presence of any fixed flexion contracture. A thorough preoperative evaluation was done of all patients.

Total knee arthroplasty was performed by the same surgical team under general or regional anesthesia, patient in supine position with knee flexed to 90 degrees. A pneumatic tourniquet was used for all the patients to stop blood flow during the surgery, while a suction drain was applied after the surgery. After completion of the surgery, the patient's knee was immobilized in a Jones compressive bandage and a knee immobilizer immediately postoperatively.

The patients were started on IV antibiotics and DVT prophylaxis in the form of subcutaneous low molecular weight heparin. These patients were followed up at regular intervals at 4 weeks, 12 weeks, and 24 weeks of the postoperative period. The patients were assessed for the clinical and functional outcome at the end of 24 weeks using the knee society score.

Study analysis

Data was analyzed pre-operatively with an assessment of knee clinical and knee functional scores. Postoperatively data was analyzed with knee functional and clinical scores again. The pre- and post-operative scores were entered in Microsoft excel and analyzed using statistical package for the social sciences (SPSS) version 20 software. Statistical tests like paired t-test and Chi-square test were used. All statistical analyses were considered significant at p value <0.05.

Pre-operative evaluation

A detailed history of all patients was taken. All patients were assessed clinically and functionally using the knee society score. The preoperative medical evaluation of all patients was done to prevent potential complications that could be life-threatening or limb-threatening. Any limb length discrepancies were noted. The presence of any hip and foot deformities was assessed. The extensor mechanism was assessed for any quadriceps contractures. The knee deformities were examined for any fixed varus or valgus deformities or the presence of any fixed flexion contracture. Standard guidelines were utilized to get knee radiographs – standing anteroposterior view and a lateral view and a skyline view of the patella.

Surgical technique

An anterior midline incision was made at the knee in 90-degree flexion from 3cm to 5 cm above the superior pole of the patella to below the level of the tibial tubercle distally. A medial parapatellar approach was taken and patella was retracted laterally. After exposure to the

degenerated femoral condyles, the retro patellar fat pad was excised.

With the knee extended, elevate a subperiosteal sleeve of soft tissue from the proximal medial tibia, including the deep and superficial MCL, and insertion of the pes anserinus tendons. Continue the elevation with a periosteal elevator to free the posterior fibers. Release the insertion of the semimembranosus muscle from the posteromedial tibia. The release was extended distally on the anteromedial surface of the tibia and stripping of the periosteum was done medially from the tibia. Extension of subperiosteal stripping posteriorly and distally was done in severe deformity cases. In flexion contracture cases, release or transverse division of the posterior capsule was done.

Distal femur resection was done with either the standard resection slot, which provides a 9 mm resection from the prominent distal condyle or the +4 mm resection slot which provides a 13 mm resection. If headless pins are used, adjustment of the resection block can be done 2 mm proximally or distally. Assemble the distal resection guide and valgus alignment guide onto the intramedullary alignment rod. The 5 to 7-degree valgus cut was made to get a distal cut which is perpendicular to the mechanical axis. Ensure that the resection block is seated flush against the anterior rough cut and lock the assembly with the thumbscrew. Fix the distal femoral resection block to the anterior cortex with two headless pins. Resection of the distal femur was done using the standard resection slot which provides 9 mm resection from the prominent distal condyle.

The extramedullary tibial guide was assembled composing of the cross head with a pin, resection guide, and ankle yoke. An adjustment screw was used at the ankle to align the resection guide. The long axis of the tibial resection guide should be parallel to the tibia. The resection slot should be located a few millimeters below the lowest articular surface (usually medial). To check the amount of tibial cut, the stylus was used, 2 mm for medial referencing, 10 mm for lateral referencing. With Trial Tibial Base, the extension gap was checked. The extension gap should be able to accept a minimum of 10 mm base. A symmetrical and rectangular extension gap must be obtained. The extension gap must be the same as the flexion gap. After satisfactory reduction, the patella was denervated circumferentially using the cautry.

With the knee flexed, place the appropriate size femoral trial on the distal femur using the femoral impactor. Insert the trial tibial insert of equal size and appropriate thickness onto the trial base and complete the trial reduction. Bone cement was spread over the cut surfaces of the femur and tibia for preparing for the femoral and tibial component implantation. Once the cement surrounding the tibial base has cured, the appropriate tibial insert may be locked into place. After the closure of the capsule and the extensor mechanism patella-femoral tracking was assessed. Wound closure done in layers. The compressive dressing was given.

Post–op protocol

The patient's knee was immobilized postoperatively in a Jones compressive bandage and by a long knee immobilizer. The patients were started on routine IV antibiotics and DVT prophylaxis in the form of subcutaneous low molecular weight heparin. 1st post-op day, static quadriceps exercises were advised to the patients. 2nd post-op day wound inspected after debulking the dressing. The patient was made to walk full weight bearing within the limits of pain with the knee immobilizer and advised to continue static quadriceps exercises. 4th post-op day, knee flexion and dynamic quadriceps exercises were started. IV antibiotics were given up to the 5th post-operative day and then converted to oral antibiotics for the next five days. DVT prophylaxis was given for the first five days post-operatively to all patients. 12th post-op day, sutures were removed and the patient was advised to continue regular physiotherapy along with full weight-bearing exercises.

Follow up

The patients were assessed 1-week post operatively for any signs of post-operative infection. Once the post-operative infection was ruled out clinically, these patients were followed up at regular intervals at 4 weeks, 12 weeks, and 24 weeks of postoperative period. The patients were assessed for the clinical and functional outcome at the end of 24 weeks using the knee society score.

RESULTS

Among the 30 total knee replacement patients assessed by the knee society clinical scoring system in this study, 2 patients (6.7%) between 45 to 50 years, 1 patient (3.3%) between 51 to 55 years, and 9 patients (30%) between 56 to 60 years, 8 patients (26.7%) between 61 to 65 years, 8 patients (26.7%) between 66 to 70 years, 2 patients (6.7%) between 71 to 75 years (Table 1 and Figure 1).

Table 1: Age distribution.

Age	Frequency	Percentage
45-50	2	6.7
51-55	1	3.3
56-60	9	30.0
61-65	8	26.7
66-70	8	26.7
71-75	2	6.7
Total	30	100.0

The majority of the patients that were included in our study population were females (73%). Males represent just 27% of the total patient population. This implies that there was

a female predominance in the ratio of 3:1 in our study (Table 2 and Figure 2).

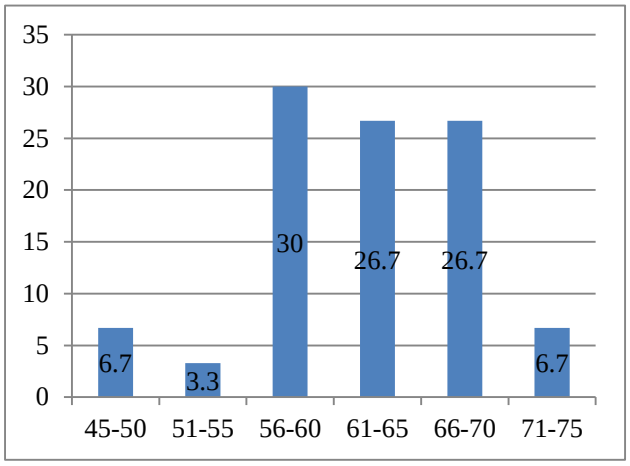

Figure 1: Age distribution.

Table 2: Gender distribution.

Sex	Frequency	Percentage
Female	22	73.3
Male	8	26.7
Total	30	100.0

Right side involvement was 53% and the left side was 47%. This implies that no limb is more prone to osteoarthritis in our study (Table 3 and Figure 3).

Table 3: Side distribution.

Side	Frequency	Percentage
Left	16	53.3
Right	14	46.7
Total	30	100.0

The average pre-op knee clinical score was 36.93±9.01 in this study which improved to an average post-op score of 84.70±8.21 at the end of 6 months (Table 4).

Among the 30 total knee replacement patients assessed by the knee society clinical scoring system in this study, 25 patients (83%) had excellent, 3 patients (10%) had good, and 2 patients (7%) had fair results (Table 5 and Figure 4).

Our study is compared to other studies conducted by Rand et al, Martin et al and our study has shown the same results. The pre-operative clinical score was 36.93 which improved post operatively to 84.70.

The average pre-op knee functional score was 16.83±10.46 in this study which improved to an average post-op score of 71.17±9.35 at the end of 6 months (Table 6).

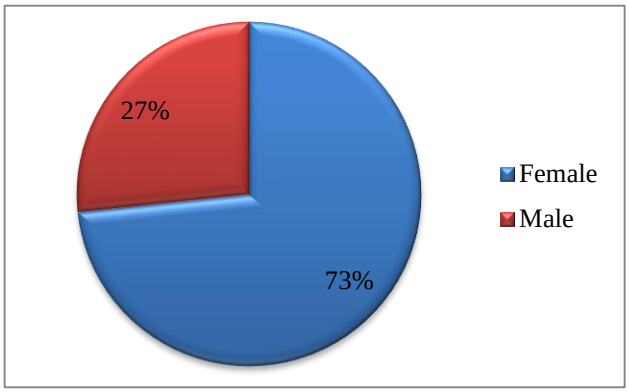

Figure 2: Gender distribution.

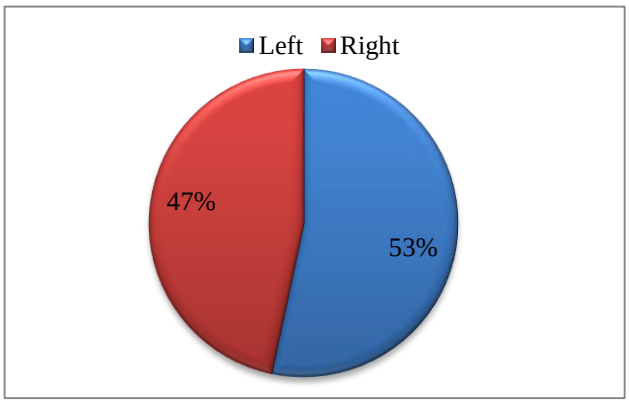

Figure 3: Side distribution.

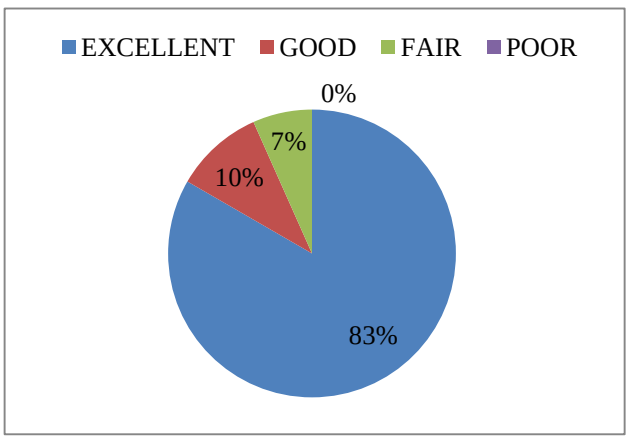

Figure 4: Grading of knee clinical score.

Table 4: Knee clinical score of patients studied.

Knee clinical score (KCS)	N	Mean	SD	t value	P value
Pre-op KCS	30	36.93	9.01	38.213	<0.001
Post-op KSC	30	84.70	8.21		

Table 5: Grading of knee clinical score of patients studied.

Grading	Frequency	Percent
Excellent	25	83.3
Good	3	10.0
Fair	2	6.7
Poor	0	0
Total	30	100.0

Table 6: Comparison of pre and post-operative knee clinical score.

Study	Pre-op mean	Post-op mean
Our study	36.93	84.70
Fitch et al (2014)[90]	46	84
Scott (2006)[89]	48	86
Martin et al (1997)[88]	51	89
Cllahanetal (1995)[87]	40	80
Christopher (1994)[28]	45	89
Rand (1991)[86]	32	84

According to the knee functional scoring system of the 30 patients assessed in these study 8 patients (27%) had excellent, 16 patients (53%) had good, 5 patients (17%) had fair and 1 patient (3%) had poor results (Figure 5).

Total functional score (knee society functional score) preoperatively was 16.83 which improved to 71.17 post-operatively (Table 8).

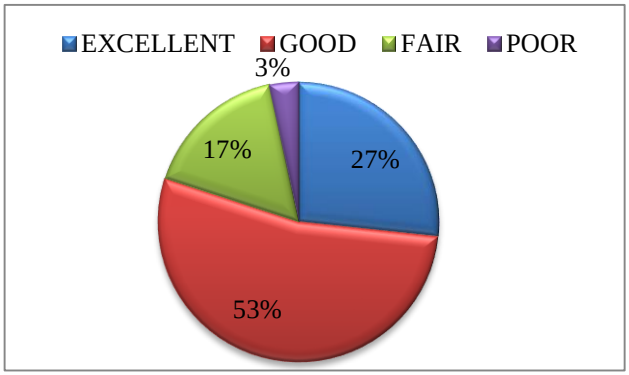

Figure 5: Grading of knee functional score.

Table 6: Knee functional score of patients studied.

Knee functional score (KFS)	N	Mean	SD	Wilcoxon signed rank value	P value
Pre-op KFS	30	16.83	10.46	4.826	<0.001
Post-op KFS	30	71.17	9.35		

Table 7: Grading of knee functional score of patients studied.

Grading	Frequency	Percent
Excellent	8	26.7
Good	16	53.3
Fair	5	16.7
Poor	1	3.3
Total	30	100.0

Table 8: Comparison of pre and post-operative knee functional score.

Study	Pre-op mean	Post-op mean
Our study	16.83	71.17
Fitch et al (2014)[32]	48	87
Scott (2006)[45]	44	82
Martin et al (1997)[58]	49	72
Cllahanetal (1995)[57]	38	79
Christopher (1994)[22]	72	78
Rand (1991)[5]	49	86

DISCUSSION

Total knee arthroplasty is generally an effective procedure and is associated with substantial functional improvement. Elderly patients who were having difficulty mobilizing because of degenerative arthritis found good relief after total knee arthroplasty. There was a substantial relief of joint pain, increased mobility, correction of deformity, and an improvement in the quality of life of the patients following total knee arthroplasty.

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.[6] 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.[7] Nutton concluded that knee function was not improved by patella resurfacing when compared to a matched group of patients without resurfacing.[8] Wood et al concluded that total knee arthroplasty with patellar resurfacing exhibited inferior clinical results as compared to total knee arthroplasty with patellar retention. 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.[9]

The post-operative functional and clinical outcomes of total knee arthroplasty were assessed by using the knee society score. The system is subdivided into a knee clinical score that assesses only the knee joint itself and a knee functional score that rates the patient's walking ability and ability to climb stairs. In comparison to studies conducted by other authors like Rand, Callahan et al, Martin, Richard,

Fitch et al, we have got comparatively same results, as both knee society clinical and functional score improved from 36.93 to 84.70 and 16.83 to 71.17 respectively.[10-14]

This study has the limitations associated with a retrospective study. Also, it is a single-institution database study. Due to time constraints and covid pandemic, a smaller sample size was taken for the current study and follow up was restricted up to 6 months.

CONCLUSION

Total knee replacement shows drastic improvement in the functional ability of the patient and the ability of the patient to get back to a pre-disease state, which is mainly because of pain-free joint movements, reflected by the improvement in the post operative knee clinical score and knee functional score.

At six months follow up an average pre-operative knee clinical score of 36.93 improved to an average post-op knee clinical score of 84.70 and an average pre-op knee functional score of 16.83 improved to an average post-op knee functional score of 71.17 by use of posterior cruciate substituting design total knee replacement which is comparable with international results.

Total knee arthroplasty is a relatively safe and sure procedure in the hands of the experienced surgeon with proper patient selection, proper procedure, and rehabilitation.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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