

FUNCTIONAL OUTCOME IN TOTAL KNEE REPLACEMENT

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ABSTRACT

BACKGROUND

Osteoarthritis is one of the most frequent musculoskeletal disorders, responsible for the recurring work incapacity of the individuals affected. The primary treatment for patients with end stage arthritis of the knee is total knee arthroplasty (TKA). There is paucity of studies in India regarding the functional outcome of TKA.

MATERIALS AND METHODS

This is a prospective study of patients from in and around Kottayam diagnosed with Osteoarthritis of the knee joint and treated with Total Knee Arthroplasty during the period from August 2016 to June 2017 at Government Medical College Kottayam.

Preoperative function and functional outcome of patients who underwent total knee replacement for osteoarthritis at the department of Orthopaedics, Government Medical College were assessed and compared.

RESULTS

34 total knee replacements did on 34 patients were studied with functional assessment using knee score at 3 months, 6 months and one year.

Ten (29.5%) patients had excellent results, seventeen patients (50%) had good results and seven patients (20.5%) had fair results. The majority of the study group were motivated for total joint arthroplasty by severe pain and pain relief was found to be the most important long-term outcome for a patient which correlates with patient satisfaction. Pre-operative status has been the strongest determinant of post-operative pain relief and functional outcome. The complications encountered in our study were infection and knee stiffness.

CONCLUSION

Total Knee Arthroplasty remains the 'gold standard' treatment for end stage Osteoarthrosis of the knee joint with respect to pain relief and activities of daily living. Differences in occupation, income, educational status and urban rural divide can be overcome by patient education and application of scientific protocols in planning treatment measures.

KEYWORDS

Osteoarthritis, Total Knee Arthroplasty, Functional Status.

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BACKGROUND

Osteoarthritis is a chronic joint disorder in which there is progressive softening and disintegration of articular cartilage accompanied by new growth of cartilage and bone at the joint margins (Osteophytes) and capsular fibrosis.

OA is the commonest of all joint diseases. Men and women are equally prone for the disease, but more joints are affected in women than in men.^{1,2} Radiographic surveys suggest prevalence rises from 1% below the age of 30 years to over 50% of the people above the age of 60 years.

Knee replacement provides a way to overcome all afflictions of arthritis.³ Knee replacements are one of the most successful orthopaedic surgeries with immense patient

satisfaction. In the past several techniques were used for the management of an arthritic knee with unsatisfactory results. The methods consisted of analgesics, heat, physiotherapy, osteotomies, arthrodesis which all produce suboptimal results. Of all the methods, replacements give the best results with pain relief and improved functional outcome.

Our group of patients from rural Kerala in and around Kottayam present to us with certain unique problems and limitations with regard to Total Knee Arthroplasty. They belong to the high-risk category as far as arthroplasty is concerned due the greater amount of physical exertion in their occupation, means of transport in their daily lives, late presentation to the hospital, belief in native treatment methods and loss of follow up in the post-operative period.

MATERIALS AND METHODS

This is a prospective study of patients from in and around Kottayam diagnosed with Osteoarthritis of the knee joint and treated with Total knee arthroplasty during the period from August 2016 to June 2017 at Government Medical College Kottayam.

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The individuals who were posted for total knee arthroplasty for osteoarthritis of knees and satisfied the following inclusion criteria were approached about the study participation. Informed consent was taken & the subjects were then included in the study. Patients undergoing revision knee replacements, with inflammatory arthritis and those who refuse to sign the consent forms are excluded. Socio demographic details & clinical details will be collected using a proforma. All patients underwent operative treatment with Total knee replacement. The preoperative functional status was assessed using Knee Society scoring system.

Pre-Operative Evaluation

Initial assessment of a patient included detailed clinical history, a thorough physical examination, and an accurate assessment of the patient's current ambulatory status and need. The patients were initially given analgesics and physiotherapy involving static quadriceps strengthening exercises.

Pre-Operative Planning

Plain radiographs and routine blood investigations including markers for infection (Total and Differential count, ESR and CRP) were obtained. The radiographs were evaluated for varus / valgus angulation of each knee and were completely documented. The Q angles of both knees were determined, and the valgus cut angle was measured from full limb length weight bearing radiographs.

Operative Technique

All patients received pre-operative broad-spectrum antibiotics an hour before anesthesia. The patient was under the effect of combined spinal and epidural anaesthesia and was positioned supine on the operating table.

The anteromedial-parapatellar approach was used. With the patient supine and the knee in flexed position, a straight midline skin incision was made. The incision was deepened. Then a medial parapatellar capsular incision was made and patella was everted laterally exposing the joint cavity.

The infrapatellar pad of fat was partially excised. The anterior cruciate ligament was cut, and the menisci were excised. The hypertrophic synovium was excised, and osteophytes were removed. Since our knee prosthesis was of posterior cruciate ligament substituting design, complete resection of the PCL was made.

Varus knees were approached by progressive release of the tight medial structures were released for varus correction and lateral release for valgus correction. Fixed flexion deformity was corrected by capsular release and condylar osteotomies.

There are totally six femoral cuts (anterior, distal femoral, posterior, anterior and posterior chamfer cuts, intercondylar notch cut) and two tibial cuts (proximal and stem cut

We used an extramedullary jig for obtaining the alignment and after the anatomical axis was confirmed, the tibial cut was made 90 degrees perpendicular to the long

axis of the tibia with 0 to 5 degrees of posterior slope.

The femoral preparation was started by identifying the entry point for the intra medullary rod using the antero posterior axis, epicondylar axis, Whiteside's line and posterior condylar axis.

The flexion and extension gaps were assessed and with the knee flexed at 90°, spacer was introduced.

The femoral and tibial trial components were introduced, and trial reduction was done. The trial components were removed, and the posterior stabilized prosthesis of the appropriate size was fit into their positions after application of bone cement. Joint was reduced, and excess cement was removed. Complete hemostasis was secured. The wound was closed in layers over a suction drain. Sterile dressing was done followed by application of long knee brace.

Post-operative Care

Broad spectrum antibiotics were given for 2 days along with static quadriceps exercises on day 3 along with weight bearing as tolerated.

Follow Up

Patients were followed up at our outpatient clinic at the first, third and sixth months post operatively with case proforma, complete evaluation of knee joint function using the knee society functional score (Insall 1989) & knee society clinical score. Preoperative and postoperative knee scores are determined. Postoperative clinical and functional scores were graded as excellent (80-100) good (71-79) fair (60-69) or poor (60 and below)

Cases were evaluated with the knee society scoring system pre-operatively and at post op 1, 3, 6 months. The ranges of movements were graded and were given scores. Those with less than 50 degrees were scored 1, 51 to 75 degrees were scored 2, 76 to 100 degrees were scored 3, 101 to 125 degree were scored 4 and range of movement more than 125 degrees were given a score of 5.

Data Management and Statistical Analysis

The data was numerically coded and entered in Microsoft excel spread sheet. Further analysis was done using the software SPSS. The level of statistical significance will be p value of <0.01.

RESULTS

A total of 34 total knee replacements done on 34 patients were included in the study.

In our study; 5 patients were between fifty-one to fifty-five, 6 patients were between fifty-six to sixty years, 7 patients were in the age group of sixty-one to sixty-five, 11 patients were in the age group sixty-six to seventy years and 5 were aged above seventy.

Out of the 34 cases studied, 28 (82.4%) were females and 6(17.6%) were males.

Out of the 34 knees studied, 28 cases (82.3%) were housewives with light household jobs. Five (14.7%) were from agrarian society and one person was unemployed.

33 knees operated had varus deformity and 1 knee had valgus deformity pre-operatively.

In our study we had 16 patients with their right knee replaced, and 18 patients who had their left knee replaced. In most cases, patients had bilateral osteoarthritis but the joint with severe symptoms and more degeneration was operated.

In our study, the arthritic knees were graded based on the Kellgren and Lawrence system of grading Osteoarthritis of knee and of the 34 knee replacements done, 22 knees were of grade IV severity and 12 were of grade III severity.

Speaking of the associated comorbidities, three patients were found to have hypertension only, seven patients had Type II diabetes mellitus only, 9 had both diabetes mellitus and hypertension, 4 patients were diagnosed with coronary artery disease only, 5 patients had a combination of all three.

Range of Movement

Pre-operative and post-operative range of movements were measured, graded and compared. Out of the 34 knees operated, one knee had a range of movement greater than 125 degrees, 13 cases had between 101 and 125 degrees, 10 had between 76 and 100 degrees, 8 cases had between 51 to 75 degrees and one had range of movement below 50 degrees.

Functional Outcome

The pre-operative status and the post-operative functional outcome of our patients were measured using the Knee society scoring system (Insall modification)

Ten (29.5%) patients had excellent results, seventeen patients (50%) had good results and seven patients (20.5%) had fair results. None had poor results. The patients who had excellent results were independently ambulant, used public transportation and had complete pain relief.

Knee Society Scoring

The patients were thoroughly questioned regarding their pain relief, level of activity, mobility and functional scoring was done.

One of our patients had developed infection in the late post-operative period (3%) for which re-exploration was undertaken and through joint lavage was done. The incidence of Knee stiffness was around 3% (1 patient) in our study group.

Stability (Maximum 25 Points)		
Medial/Lateral	0 - 5	15
	5-10	10
	>10	5
Anterior / Posterior	0 - 5	10
	5-10	8
	>10	5
Deductions		
Extension Lag	None	0
	<4°	-2
	5 - 10°	-5
Flexion Contracture	<5°	0
	6 - 10°	-3
	11 – 20°	-5
Malalignment	>20°	-10
	5 – 10 °	0
	>10°	-2 Points/ 5°
Pain at Rest	Mild	-5
	Moderate	-10
	Severe	-15

Table 1. Knee Society Score (Insall Modification)

Age Distribution	%
51-55	14.7
56-60	17.6
61-65	20.6
66-70	32.4
above 70	14.7
Gender (%)	
Male	17.6
Female	82.4
Occupation (%)	
Unemployed	3%
Agriculture	14.7%
Housewife	82.3%
Deformity (%)	
Varus	97.1
Valgus	2.9
Side Distribution (%)	
Right	53.3
Left	33.3
Bilateral	13.3
Stage of Arthritis	
Grade OA (%)	
Grade 3	35.3
Grade 4	64.7

Table 2

Pain (Maximum 50 Points)		
Walking	None	35
	Mild	30
	Moderate	15
	Severe	0
Stairs	None	15
	Mild	10
	Moderate	5
	Severe	0
Range of Motion (Maximum 25 Points)		
5° = 1 Point		

Comorbidities	Frequency	Percent
None	6	17.6
diabetes	7	20.6
Hypertension	3	8.8
CAD	4	11.8
Diabetes and Hypertension	9	26.5
Diabetes Hypertension and CAD	5	14.7
Total	34	100.0

Table 3. Associated Comorbid Conditions

Complication	Number of Patients
Infection	1
Knee stiffness	1

Table 4



Figure 1. Case Illustration Pre-Operative

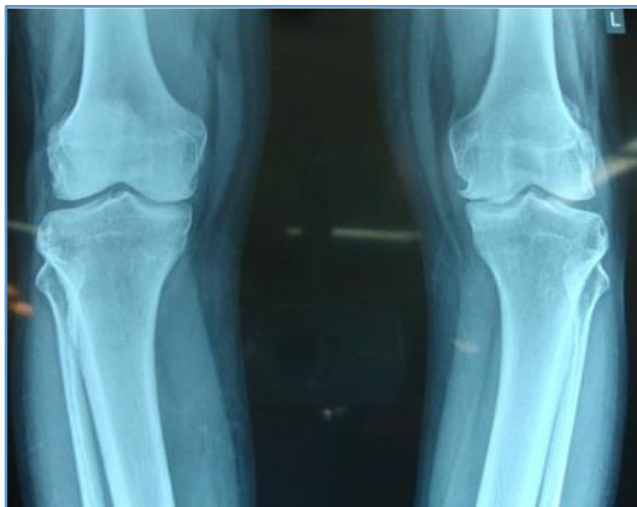


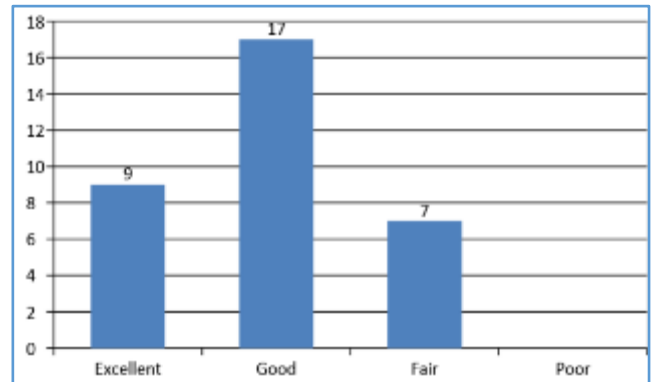
Figure 2. Radiograph 1



Figure 3. 6 Months Post-Operative



Figure 4. Radiograph 2



Graph 1. Functional Outcome

DISCUSSION

The field of adult joint reconstruction has been at the forefront of changing concepts and evolving trends in Orthopaedics.

Our study population was from in and around Kottayam town. We aimed to analyze the functional outcome in these patients diagnosed with Osteoarthritis of the knees who were treated with Total knee arthroplasty. The objectives of our study were to assess the outcome of patients undergoing total knee replacement for osteoarthritis at 1 month, 3 months and 6 months post operatively with appropriate scoring system.

During the course of our study we understood that our study population was motivated towards arthroplasty by the severity of pain more than the restriction of movements. D.W. Murray et al had found that the level of pain correlates with patient satisfaction and predicts the need for subsequent revision.⁴ The expectations of our patients were complete pain relief, independent ambulence and use of toilet, ability to climb stairs, use of public transportation and early return to their daily activities.

The patients in our study were evaluated for their pain relief and functional outcome using knee society scoring system^{5,6,7} respectively following total knee replacement. It was observed that nine patients had excellent outcome and were satisfied with the results, seventeen had good outcome, satisfaction level was moderate, and seven patients had fair outcomes. The grading of the functional

outcome scores was based on the scales of excellent (≥ 80), good (70–79), fair (60–69), and poor (< 60) as defined in the review article on 'the Utility of Outcome Measures in Total Knee Replacement Surgery' by Michelle M Dowsey and Peter F M Choong. The results in our study are comparable to that of Vince et al on 'long term result of cemented total knee arthroplasty'.³ The good results in majority of our cases reinforces the fact that total knee replacement is the gold standard for end stage arthritis of the knee joint as had been proved in the meta-analysis by the U.S. Department of Health And Human Services on 3519 references on total knee arthroplasty.

The good to excellent outcomes in both males and females of our study group correlates with the results of various studies done on the effect of gender on total knee arthroplasty outcomes. Ritter MA et al on 'the clinical effect of gender on outcome of total knee arthroplasty', Elizabeth R Volkman et al on 'reducing gender disparities in post-total knee arthroplasty expectations' and the meta-analysis by the U.S. Department Of Health And Human Services have proved that both sexes have equally good functional outcomes following total knee replacement surgeries.^{1,8}

The average age of males undergoing total knee arthroplasty in our study was around 56.3 years and that of females was around 52.6 years which is due to the rapid progression of arthritis in the post-menopausal age group in females due to estrogen withdrawal as also proved by Jennie McKee et al.² The number of females undergoing total knee arthroplasty was 82.4% and that of males is 17.6% which is directly reflective of the prevalence of osteoarthritis and the severity of the condition among females in the community.

The commonest deformity among the 34 knee replacements included in our study was found to be Varus malalignment (97.1%) much more than the incidence of 53 – 76% reported by Cahue S et al, Cooke TD et al and Felson DT et al in their various studies on varus valgus malalignment in the progression of osteoarthritis of knee joint and patellofemoral arthritis.

Five of our patients (14.7%) were from the farming community with activities requiring active farm work. They were advised moderate farming activity and to avoid heavy manual labor during their rehabilitation period. The average duration of time before which they could resume their modified level of farming activity was found to be 3-4 months similar to the findings of the Ohio state university on 'recovery from hip and knee replacements for farmers'.⁹ There was no evidence of polyethylene wear, osteolysis, and loosening of the prosthesis during the study period on our group of patients as had been the case in the landmark study by Diduch DR, Insall JN, Scott WN et al on 'total knee replacement in active patients; long-term follow-up and functional outcome'.⁹

The incidence of preexisting or newly diagnosed systemic illness in our study was 82.3%. The commonest comorbidity associated with patients undergoing total knee arthroplasty in our study was found to be Diabetes mellitus (61.7%) followed by Systemic hypertension (50%).¹⁰

We observed that our patients presented late with severe arthritis; 64.7% in stage IV and 35.3% in stage III according to the Kellgren and Lawrence system of grading Osteoarthritis of knee joint.⁵ Henry Ellis et al had found that patients from socially backward regions with lower socioeconomic status have a tendency towards late presentation an all health-related issues.¹¹

One of the chief restraints which prevented patients from our part of the country from undergoing surgery had been the cost involved in total knee arthroplasty. We were able to overcome this, using the government aided health insurance scheme for our patients.

The incidence of knee stiffness in our series was 2.9% which is lower when compared to most of the long-term studies on the functional outcome of total knee arthroplasty.¹² No neurological complication in the immediate post-operative period was encountered. Most studies indicate that nerve injury is due to a neuropraxia of the common peroneal nerve.¹³

One patient in our study had developed infection at one month follow up. He was treated with thorough joint lavage with prosthesis retention and post-operative antibiotic therapy lasting for 6 weeks as recommended. The patient recovered from the acute infection with residual deformity and restricted range of movements of the involved knee. The disadvantages faced by patients in our study group were ignorance about the seriousness of the disease, poor symptom recognition, faith in native treatment and unwillingness or lack of desire to receive institutional treatment. Moreover, in motivated patients we have to contend with other restraints such as short duration of hospital stay and reduced number of post-operative follow up visit

CONCLUSION

It is obvious that Total Knee Arthroplasty remains the 'gold standard' treatment for end stage Osteoarthritis of the knee joint with respect to pain relief and activities of daily living. The functional outcome analysis in our study population highlights the fact that patients from rural background with moderate activities and from agrarian society when treated with standard operative techniques, post-operative rehabilitation protocol, proper patient education and lifestyle modification can achieve results comparable to any other subset of population in the society. This implies the universality of Total Knee Arthroplasty in the treatment of Osteoarthritis of knee cutting across demographic variation and socio-economic distributions.

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