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Functional outcome of patients with osteoarthritis of knee in south Indian population treated with total knee arthroplasty using all polyethylene tibial component: A prospective analysis

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Abstract

Introduction: Osteoarthritis is the commonest of all joint diseases. Degenerative arthritis of the knee is a common affliction in our Indian population with major functional, medical, psychosocial and financial effects on the affected person, family and society. Knee replacement provides a way to overcome all afflictions of arthritis and is one of the most successful orthopaedic surgeries with immense patient satisfaction.

Aim of the study: To analyse the functional outcome of patients with Osteoarthritis of knee treated with Total Knee Arthroplasty using all – poly Tibial component based on the range of motion, radiological measures and associated complications.

Materials and methods: This is a prospective study of Osteoarthritis of the knee joint and treated with Total knee arthroplasty using all-poly Tibial component during the period from June 2016 to August 2018 at Rajah Muthiah Medical College Hospital. A total of 14 total knee replacements done on 14 patients were included and followed up in the study. The pre-operative status and the post-operative functional outcome and pain relief of our patients were assessed using the Knee society scoring system and Visual analogue scale respectively.

Results: 12 patients had excellent results, 2 patients had good results. 12 patients were satisfied following their replacements (80%), 2 patients (20%) were not very satisfied and none of the patients were dissatisfied. The commonest complications we encountered were knee stiffness, persistent knee pain and transient foot drop.

Conclusion: The results of total knee arthroplasty using all polyethylene tibial component in our study population, when treated with standard operative techniques, post-operative rehabilitation protocol, proper patient education and lifestyle modification are comparable to that of any other prosthesis used for TKR.

Keywords: TKR, all polyethylene tibial component, osteoarthritis

Introduction

Osteoarthritis is a chronic joint disorder characterized by progressive softening and disintegration of articular cartilage accompanied by new growth of cartilage and bone at the joint margins i.e., osteophytes and capsular fibrosis. The cardinal features are progressive cartilage destruction, subarticular cyst formation, sclerosis of the surrounding bone and capsular fibrosis. 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.

Degenerative arthritis of knee is a common affliction in our Indian population with major functional, medical, psychosocial and financial effects on the affected person, family and society. Degenerative arthritis is a dynamic process causing pain, functional restriction and deformities, hence conservative treatment cannot stall the process of degeneration.

Knee replacement provides a way to overcome all afflictions of arthritis ^[3, 4] and is one of the most successful orthopaedic surgeries with immense patient satisfaction. Since 1973, when Insall and others⁵ had began the modern era of knee replacement the implants for total knee replacement have seen a paradigm shift in design leading to longer prosthesis life,

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better performance and increased mobility. Over the years, the dramatic improvement in techniques of replacements, usage of preoperative antibiotics, tourniquets, laminar flow theatres and appropriate patient selection have led to superior outcomes. These are people from low socioeconomic status with limited health care access, predominantly agrarian occupation and an average length of stay (ALOS) in the hospital directly related to their household economy. They belong to the high risk category as far as arthroplasty is concerned, due to 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 diagnosed with Osteoarthritis of the knee joint and treated with Total knee arthroplasty using all polyethylene tibial component during the period from June 2016 to August 2018 at Rajah Muthiah Medical College Hospital and a retrospective analysis of patients treated with Total knee arthroplasty for OA knee before and on regular follow up at our hospital during the same period. A total of 14 total knee replacements done on 14 patients were followed up and included in the study, of which 7 were females and 7 were males with an mean age distribution of 54 years.

Inclusion Criteria

Patients diagnosed with primary Osteoarthritis of the knee confirmed by clinical and radiological measures.

Exclusion Criteria

Patients with post traumatic arthritis, congenital deformities, previous knee surgery, malignancy, bleeding disorder, extensive skin disease, local and systemic infection.

Pre-operative evaluation

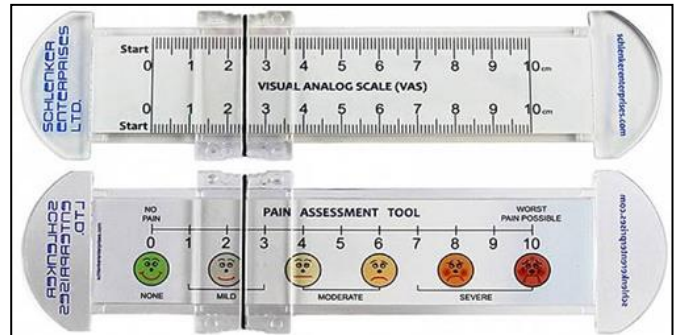
Pre operative evaluation and planning of a patient consisted of detailed clinical history, thorough physical examination, accurate assessment of the patient's current ambulatory status and need. All the patients planned for TKA were subjected to a multisystem screening protocol to rule out any foci of infection. Patients previously operated at our hospital underwent a thorough examination of their hospital records and a detailed evaluation of their preoperative and postoperative status. Plain radiographs and routine blood investigations including infection markers were taken. The Q angles of both knees were determined and the valgus cut angle was measured from weight bearing radiographs of the entire limb.



Q Angle



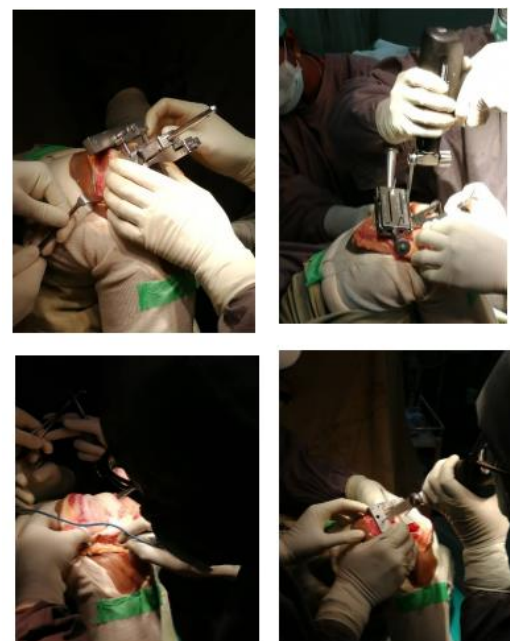
Valgus Cut Angle



Visual Analog Scale

Operative Technique

We employed the anteromedial parapatellar approach for exposure of the knee joint. Sagittal and coronal plane deformities were corrected by progressive soft tissue releases and bony procedures. The instrumentation was of the posterior referencing type with 5 degrees of in built external rotation for the femoral side and extramedullary jig for limb alignment. The bony preparation consisted of six femoral cuts (anterior, distal femoral, posterior, anterior and posterior chamfer cuts, intercondylar notch cut) and two tibial cuts (proximal and stem cuts). The implant of choice was of cruciate substituting femoral design with cementation and all polyethylene tibial component. Patellar denervation with electrocautery was done for all cases.



Post-Operative Protocol

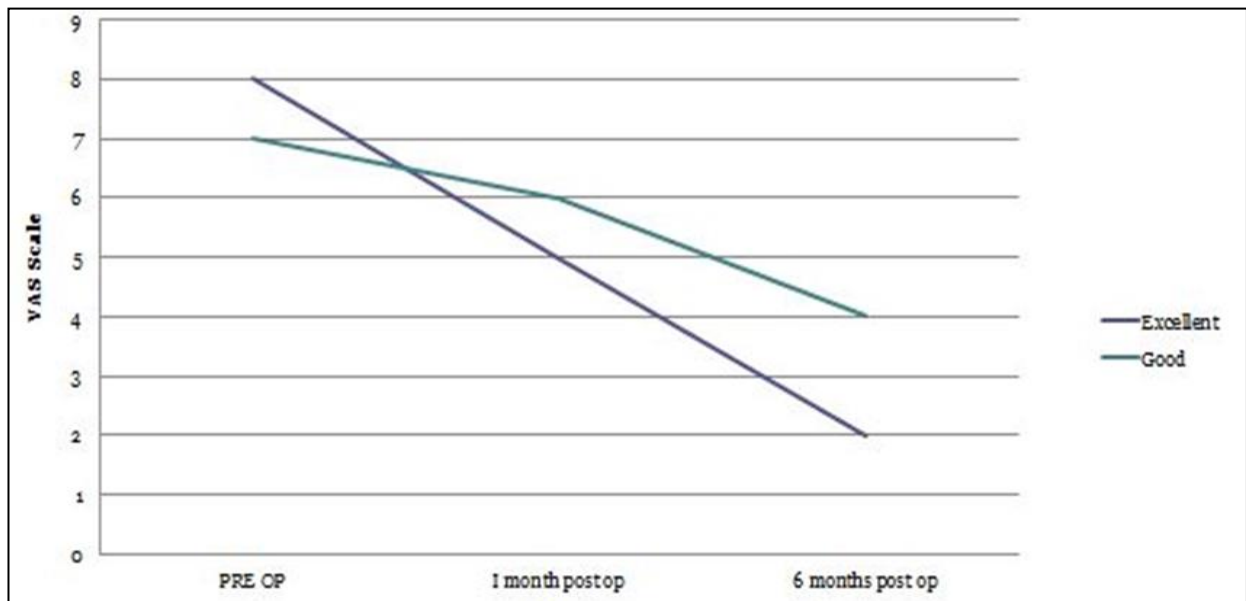
The post operative protocol started with static quadriceps strengthening exercise on the first post op day and drainremoval on 2nd post op day along with walker assisted weight bearing. On the 3rd post op day passive and active assisted knee mobilization was initiated as tolerated by the patient. The range of active and active assisted knee mobilization was progressively increased with individual variance. Suture removal was done on the 2nd week post op. Patients were discharged after thorough education regarding activity modification and rehabilitation protocol. They were followed up post operatively on the first, third and sixth months with complete evaluation of knee joint function, scoring and weight bearing radiographs of the operated knee.

Results

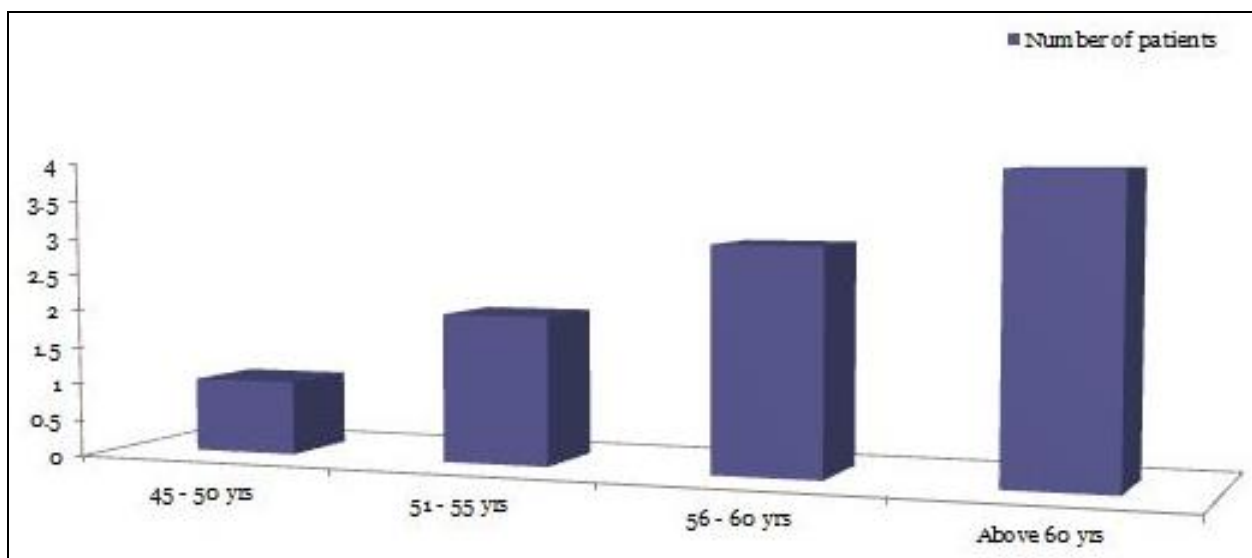
The pre-operative status and the post-operative functional outcome of our patients were measured using the Knee society scoring system (Insall modification). The painrelief was quantified using the Visual analogue scale. 12 patients had excellent results, 2 patients had good results, none patients had fair and poor results. 12 patients were satisfied

following their replacements (80%), two patients (20%) were not very satisfied and none patients were dissatisfied (0%). The common complications we encountered in our study were knee stiffness (30%), persistent knee pain, infection (15%) and transient foot drop (10%). In our study we had ten patients with their right knee replaced, 4 patients who had their left knee replaced and 2 patients with bilateral knee replacement. The osteoarthritic knees were graded based on the Kellgren and Lawrence system [6] and of the 14 knee replacements done, 10 knees were of grade IV severity and 4 were of grade III severity. The incidence of associated systemic comorbidities in our study was systemic hypertension (6 patients), type II diabetes mellitus (2 patients), coronary artery disease (2 patients), obesity (2 patients) and dental caries (2 patient). Four of our patients had more than one associated systemic comorbidity

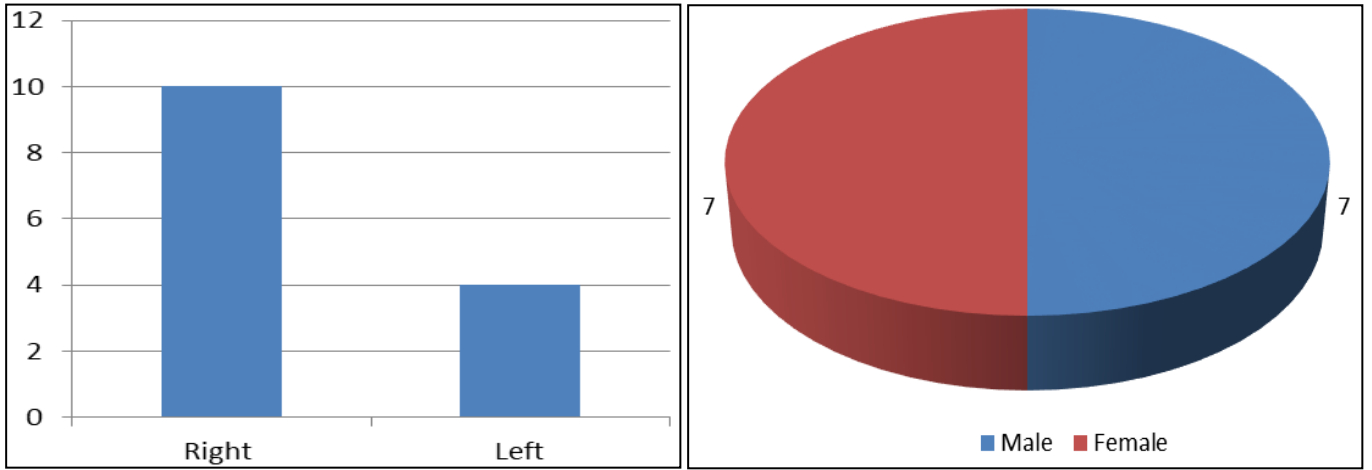
Complications	Number of Patients
Knee stiffness	5
Infection	2
Transient foot drop	1



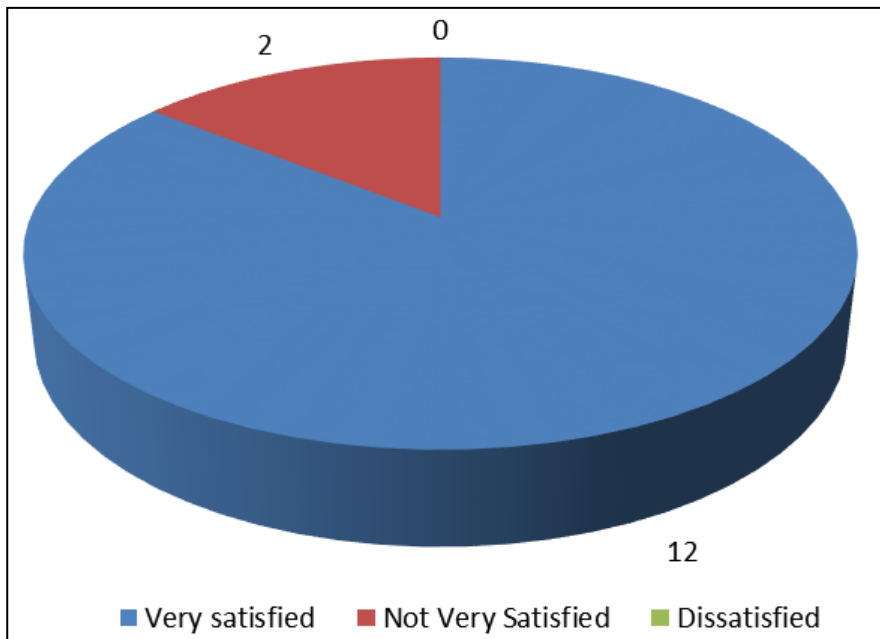
Vas Pain Relief Scale



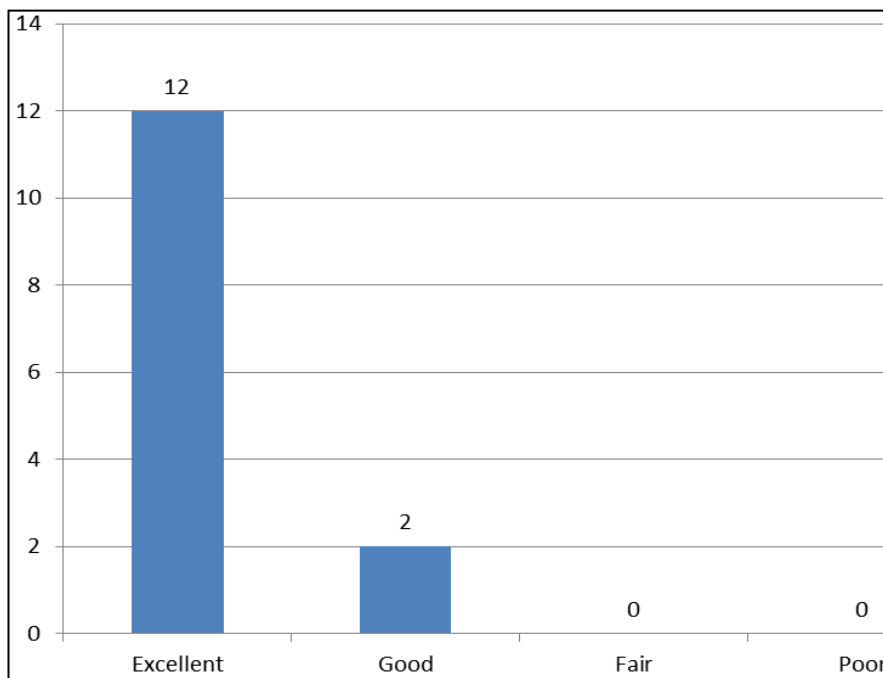
Age Distribution



Side and Sex Distribution



Patient Satisfaction



Functional outcome

Illustrations



Pre Op



Immediate Post Op

6 Month Post Op



One year Clinical Functional Outcome

Case – I



Pre Op



6 Month Post Op



One year Clinical Functional Outcome

Case - II

Discussion

The field of adult joint reconstruction has been at the forefront of changing concepts and evolving trends in Orthopaedics. The traditional teaching was to limit the use of total knee arthroplasty to patients with white collared occupation and people with limited manual labour. Thus there is an unmet need of a large subset of rural population with osteoarthritic knees who have been deprived the fruits of success of modern day arthroplasty. Our study population was among the rural plains around Chidambaram town with a predominantly agrarian based economy. During the course of our study we understood that they were motivated towards arthroplasty by

the severity of pain more than the restriction of movements. Pain relief was the most important long-term outcome for a patient correlating with patient satisfaction as also observed by D.W. Murray *et al.* [7].

The functional outcome scores (Knee Society Scoring) in our study were graded into excellent (≥ 80), good (70–79), fair (60–69), and poor (< 60) as defined by Michelle M Dowsey and Peter F M Choong [8]. The results and satisfaction level in our study are comparable to that of Vince *et al.* [3] done in 1988 on ‘long term results of cemented total knee arthroplasty’ and A S Sidhu *et al.* [9] in 2011 on ‘total knee replacement in osteoarthritis knee with genu varus deformity’.

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 ^[10] on 3519 references on total knee arthroplasty. These good to excellent outcomes in our study have been on patients from rural areas using all polyethylene tibial component who are traditionally out of the ambit of advanced health care services as had been the case with Ippolyti Papakostidou *et al.* ^[4] who observed that residents of rural areas and lower socio economic strata can give equally good post operative results following TKA using all poly ethylene tibial component.

The equally good results in both males and females of our study group correlates with that of various studies done on the effect of gender on total knee arthroplasty outcomes ^[1,10]. 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 due to the rapid progression of arthritis in the post-menopausal age group as had been studied by Jennie McKee². The number of females undergoing total knee arthroplasty in our study was 50% and that of males is 50% which is directly reflective of the prevalence of osteoarthritis and its severity among females in the community.

The commonest deformity among the 14 knee replacements included in our study was found to be varus malalignment (86%) much more than the incidence of 53-76% reported by Cahue S *et al.* ^[11] and other studies. The incidence of flexion deformity in our study group was around 10%. Around 80% of our patients were from the farming community with activities requiring active farm work or cattle rearing or both in many of the cases. They were advised moderate farming activity and to avoid heavy manual labour during their rehabilitation period. They were also advised not to step into the wet fields and restrict themselves from activities that may affect the stability and longevity of the prosthetic knee. 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 university¹² on 'recovery from hip and knee replacements for farmers'. The incidence of pre existing or newly diagnosed systemic illness in our study was 63%, commonest being systemic hypertension followed by diabetes mellitus. 2 patients in our sample group with associated obesity had good to excellent outcomes post operatively over an average of 6 months to one year follow up period and were satisfied with their results as also been observed by Ippolyti Papakostidou *et al.* ^[4] and McQueen DA *et al.* ^[13]. Henry Ellis *et al.* ^[14] had found that patients from socially backward regions with lower socioeconomic status have tendency towards late presentation on all health related issues as had been the case in our study with 80% presenting to us in stage IV and 20% in stage III of osteoarthritis.

Pre-operative status has consistently been shown to be the strongest determinant of post-operative pain and functional outcome ^[14], which has been the case with the two patients who had poor outcomes in our study. We were able to notice that this stratum of patients had increased expectations of their post operative status despite the advanced stage of arthritis and associated comorbidities. The primary reason for knee stiffness (30%) in our study was found to be the reduced number of follow up visits and reluctance to follow regular rehabilitation programs after pain relief. They did not have significant disability in the long term follow up, but had difficulties in immediate post-operative rehabilitation. One

patient in our study had developed infection during immediate post op. She was treated with thorough joint lavage with prosthesis retention and post-operative antibiotic therapy lasting for 6 weeks as had been suggested by Rand *et al.* ^[15]. The patient recovered from the acute infection and restricted range of movements of the involved knee.

Conclusion

The functional outcome analysis in our study population using all polyethylene tibial component highlights the fact that patients from rural background 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 and also to any other tibial prosthesis used for TKA. This implies the universality of Total Knee Arthroplasty using all poly tibial component in the treatment of Osteoarthritis of knee cutting across demographic variation and socioeconomic distributions and also comparable to that of metal backed tibial component in our population.

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