

Analysis of Tricompartmental Osteoarthritis Knee Treated with Total Knee Arthroplasty

Regupathy Annamali¹, Bobba Rajesh²

Author Affiliation: ¹Associate Professor ²Assistant Professor, Department of Orthopaedics, Karpaga Vinayaga Institute of Medical Sciences and Research Center, Madhurantagam, Kancheepuram, Tamil Nadu 603308, India.

Corresponding Author: R. Annamalai., Associate Professor, Department of Orthopaedics, Karpaga Vinayaga Institute of Medical Sciences and Research Foundation, Madhurantagam, Tamil Nadu 603308, India.
E-mail: annuregu@yahoo.com

Received: 26 December, 2017, **Accepted on:** 10 January 2018

Abstract

Background: Total joint arthroplasty are simple to relieve pain, to provide motion while maintaining stability and to correct deformity. Current total joint prosthesis which is properly implanted, consistently achieve excluding high success rates, in meeting these goals in both short term and long term follow up studies. The aim of this study is to analyze the functional outcome of fixed bearing total knee arthroplasty. To assess the functional outcome in patients undergoing total knee arthroplasty using knee society knee score system. *Materials and Methods:* This study was conducted in a tertiary care set up. This is a Prospective study conducted during the period of June 2009 – September 2014. Study includes 40 patients who underwent total knee Arthroplasty in 40 knees. Post traumatic arthritis patients were excluded from the study. *Results and Discussion:* In this study except two patients all others showed an improvement in knee score. Among those, 39 patients had excellent scores (85-100), 1 patients had good score (70-84). The mean increase in Knee score was 48.17. In our study we observed that the return to function is excellent to good at the follow up. All our patients showed an improvement in knee score except two. 19 patients had excellent scores (85-100), 1 patients had good score (70-84), 0 patients had fair results (60-69) and 0 had poor results. The mean increase in Knee score was 48.17. The function score was also improved from 19.75 in the preoperative period to 80.82 in the postoperative period. *Conclusion:* From this study it can be concluded that, the average postoperative range of movement improved to 101.89 degrees from the preoperative range of 92.7 degrees. The mean preoperative Knee society knee score was 36.03, while the mean postoperative score was 84.2 indicative of the overall good functional outcome.

Keywords: Arthritis; Tricompartmental Osteoarthritis; Knee Replacement; Knee Arthroplasty; Knee Score; Joint Prosthesis; Rheumatoid Arthritis.

Introduction

The knee is composed of several major parts, including: the femur, tibia (the shin bone), and the patella (the knee cap). The femur rotates on the tibia's upper end and the patella slides in a groove on the end of the Femur. The knee pivots at the point where the thighs meet the lower leg [1,2]. Normal daily activity the articulating surfaces experience damages

leading to pain and hence reduction of mobility. The first modern type of total knee replacement was designed by Theophilus Gluck (German surgeon) in 1890. He used concept of surface replacing with ivory components attached to the bone with cement made of colophony, pumice and plaster of Paris [1-4]. However, neither the ivory nor the cement could withstand the forces applied to the knee and infection became a major problem.

Knee replacement surgery, or knee arthroplasty, is a procedure performed to remove a severely damaged knee joint and replace it with an artificial knee joint composed of metal alloys, high-grade plastics, and polymers [3-5]. Knee joints are commonly replaced due to osteoarthritis, rheumatoid arthritis, or severe injury to the knee. Knee replacement surgeries are most commonly performed to treat severe joint damage caused by osteoarthritis and rheumatoid arthritis [6-8]. Meniscus tears, cartilage defects, and severe ligament tears can also necessitate this procedure [7-9]. Some signs and symptoms for a knee replacement include, knee pain, difficulty in walking, difficulty standing up from a seated position, moderate to severe knee pain while at rest, failure of previous knee pain treatments, or a knee deformity [9].

The goals of total joint arthroplasty are simple to relieve pain, to provide motion while maintaining stability and to correct deformity [8-10]. Current total joint prosthesis which is properly implanted, consistently achieve excluding high success rates, in meeting these goals in both short term and long term follow up studies [9]. Tricompartmental knee replacement was a safe and effective procedure for the patients reported in recent studies. The knee pathology and the type of prosthesis were significant predictors of outcomes in knee arthroplasty [9-12]. The aim of the present study was to analyze the functional outcome in fixed bearing total knee arthroplasty. And also to assess the functional outcome in patients undergoing total knee arthroplasty using knee society knee score system.

Materials and Methods

The study was conducted at Karpaga Vinayaga Institute of Medical Sciences and Research Center, Madhurantagam, Tamilnadu. This is a Prospective study conducted during the period of June 2009 – September 2014. Patients with bicompartamental arthritis of knee osteoarthritis, rheumatoid arthritis, and neutral, varus, valgus and flexion deformity $<30^\circ$ were considered for the study. A total of 40 patients who meet the above criterion and ready to undergo total knee arthroplasty were selected for the study. All were cruciate substituting posterior stabilized design. The parameters evaluated were age, gender, diagnosis, preoperative knee flexion and extension, preoperative flexion arc, tibio femoral angle, Knee Society knee score and functional score, and implant design. Constrained and mobile bearing designs which substituted for PCL such as RPF & TC3 were

not included in the study. Patients with post traumatic arthritis were excluded for the study. Patients were assessed prospectively with KSKS score sheet [Knee score (100 points), the knee function score (100 points)]. Score between 100-85 points are considered excellent, 84-70 points are considered good, 69-60 points are considered fair, <60 points are considered poor results. The knee flexion is measured using goniometer. X-ray radiographs with merchant $30/60/90^\circ$ views were performed preoperatively and postoperatively at 6 weeks, 3 and 6 months, 1, 2 and 5 years. The position of the patella was measured from the merchant view producing an angle between a line through the most prominent parts of the femur and a line through the backside of the patellar component. Mean and median values were used for further analyses.

Post Operative Protocol

Ankle and toe movements are encouraged from day one. Epidural analgesia is administered for 48 hrs in some cases. Drain removal done after 24-48 hrs. Intravenous antibiotics are given for 5 days. Physiotherapy is started from first day of surgery. Static gluteal and quadriceps exercises are taught. The patient is made to sit up in bed and also with legs hanging by the side of the bed. Weight bearing with walker support is allowed with knee in an immobilizer after drain removal. All the patients were advised to do physiotherapy till the discharge. Post operative follow up is done after 1, 3, 6 months and yearly thereafter.

Results

There are 40 patients in the study and total of 40 knee arthroplasty were operated. The average age of the patients recruited for the study was 60 years. Out of 40 patients 26 were female patients and 14 were male patients (Table 1). Left knee replacement was done in 24 patients where as right knee replacement was done in 16 patients by total knee arthroplasty surgery. In 40 patients, 38 patients were suffering from osteoarthritis and 2 patients were diagnosed as rheumatoid arthritis (Table 1).

The mean range of flexion in our study is 101.89° which has improved from the preoperative range of 92.7 degrees (Table 2). The average postoperative flexion in the rheumatoid group was 102.5 degrees and in the osteoarthritis group was 101.3 degrees (Table 2). In one case there was haematoma and delayed wound healing, so haematoma drained and

Table 1: Demographic features of the study population

Patients Demographics	Total
No. of patients	40
No. of Knees operated	40
Female	26
Male	14
Side	
Left	24
Right	16
Osteoarthritis (OA)	38
Rheumatoid arthritis (RA)	2

Table 2: Range of Motion

Disease	Preoperative Flexion	Postoperative Flexion
Osteoarthritis	92.7	101.3
Rheumatoid arthritis	93.2	102.5

Table 3: Scoring System

Scoring System	Preoperative	Postoperative
Knee Society Score	36.03	84.2
Functional Score	19.75	80.82

secondary suturing done. In our study we observed that the return to function is excellent to good at the follow up. All our patients showed an improvement in knee score except two. 19 patients had excellent scores (85-100), 1 patients had good score (70-84), 0 patients had fair results (60-69) and 0 had poor results. The mean increase in Knee score was 48.17 (Table 3). In our study except two patients all others showed an improvement in knee score. The function score was also improved from 19.75 in the preoperative period to 80.82 in the postoperative period (Table 3). Out of 40 patients, 39 patients had excellent scores (85-100), 1 patients had good score (70-84), the mean increase in Knee score was 48.17. During the follow up period of the study none of the implant needed to be revised.

Discussion

The evolutions on the designs of prosthesis resulted in posterior cruciate retaining prosthesis and the rotating platform prosthesis [13-15]. We in our study used the fixed bearing prosthesis as is done in our institution. We have assessed the clinical outcome after the procedure with the help of knee society scoring system. Some conventional fixed-bearing total knee arthroplasty (TKA) have been proved to be clinically successful [16]. Survivorship of the Genesis (Smith and Nephew, Memphis, TN) TKA was 96% at 10 years follow-up. Ritter et al

reported a survivorship of 97.8% at 20 years with the Anatomic Graduated Components (Biomet, Warsaw, IN) TKA [17]. The survival rate of the Total Condyle knee prostheses (Howmedica, Rutherford JN) was 95% at 15 years 33, 98% at 20 years and 91% at 23 years in different studies [17]. The average postoperative range of movement improved to 101.89 degrees from the preoperative range of 92.7 degrees. The mean preoperative Knee society knee score was 36.03, while the mean postoperative score was 84.2 indicative of the overall good functional outcome. The average postoperative flexion in the rheumatoid group was 102.5 degrees and in the osteoarthritis group was 99.82 degrees. The mean preoperative functional score was 19.75, while the mean postoperative score was 80.82 indicative of the overall good functional outcome. 39 patients had excellent score (85-100), 1 patient had good score (70-84) [17- 20].

Vasdev A et al., in 2009 studied in 120 consecutive patients with the mean age of 63 years who had arthritis of the knee with similar deformity and range of motion [21]. The study included 60 cases of Total knee Arthroplasty with a mean age of 63 years. The male to female ratio was 20:40 with a mean follow up of 3 years. The preoperative average range of motion was 88.5° with a Knee society score of 36.5. The postoperative average range of motion was 101° with a Knee society score of 91.7. The survival rate was 96%. When we compare this study to ours the average range of motion is improved in the same way

to 101.89, but the KSS score is increased to 84.2 when compared to 91.7. They were randomised to undergo TKA using a fixed- or mobile-bearing prosthesis. Knee Society knee and functional scores, range of motion, and the presence of flexion contracture were assessed [22–24]. The male to female ratio was 20:40 with a mean follow up of 3 years. The preoperative average range of motion was 88.5° with a Knee society score of 36.5. The short term study by Parsch D, evaluated the outcome of 65 knees and the mean score in these patients were 76 and average knee flexion was 118 degrees [8]. The postoperative average range of motion was improved to 101° with a Knee society score of 91.7. The survival rate was 96%. As a result of this study the mid-term outcome of the 2 groups was comparable. He concluded that long-term studies of both functional and radiological outcomes are needed to determine the indications for fixed- versus mobile-bearing prostheses [21–24].

In one report by Wylde et al 2008, the mean flexion range was 112.8° in 142 cases of fixed bearing knees 35 [24]. Study in fixed bearing knee in Indian population by Vasdev A, reported 101°±7.8° in 60 patients [21]. The mean range of flexion in our study is 101.89° which has improved from the preoperative range of 92.7 degrees and this is comparable to the present study. The average postoperative flexion in the rheumatoid group was 102.5 degrees and in the osteoarthritis group was 99.82 degrees.

Functional analysis was done by Knee society knee score in our study. A study by Lima JTKA et al., showed a postoperative mean KSS of 86.7 and mean function score of 85.0. Study conducted in Orthopaedic and Trauma Clinic, Kaunas Medical University reported significant improvement in quality of life and a better Knee Society score [12]. In our study we observed that the return to function is excellent to good at the follow up. All our patients showed an improvement in knee score except two. 19 patients had excellent scores (85-100), 1 patients had good score (70-84), 0 patients had fair results (60-69) and 0 had poor results. The mean increase in Knee score was 48.17. The function score was also improved from 19.75 in the preoperative period to 80.82 in the postoperative period. This is comparable to the study of Lima JTKA et al [12].

The published results of Kim YH, in 2009 February, reported the postoperative knee score to be 87 and the knee flexion 115+/- 18 degree which is comparable to our study [25]. In our study we noted a more knee score and less postoperative range of motion. No patients had loosening and osteolysis noted around the femoral and tibial components. No implant needed to be revised during the period of study.

Conclusion

The clinical outcome of the study was assessed by the Knee society knee score. There was a significant improvement observed in the movement of knee after surgery. The average postoperative flexion in the rheumatoid group was 102.5 degrees and in the osteoarthritis group was 99.82 degrees. The mean preoperative functional score was 19.75, while the mean postoperative score was 80.82 which is indicative of the good functional outcome. Therefore, from the observations of the present study it is concluded that total knee replacement is effective in relieving pain and improve the function of the knee joint in tricompartmental osteoarthritis patients.

Conflict of Interest

None declared

Financial Support

We did not receive any external funding for this project.

References

1. Thomsen, Morten G., et al. Indications for knee arthroplasty have remained consistent over time. *Dan Med J.* 2012;59(8):A4492.
2. Shankar NS. Minimally invasive technique in total knee arthroplasty history, tips, tricks and pitfalls. *Injury.* 2006;37 Suppl 5:S25-30.
3. Thompson SA, Liabaud B, Nellans KW, Geller JA. "Factors Associated With Poor Outcomes Following Unicompartmental Knee Arthroplasty: Redefining the "Classic" Indications for Surgery." *J Arthroplasty.* 2013;28(9):1561-1564.
4. Feczko PZ, Jutten LM, van Steyn MJ, Deckers P, Emans PJ, Arts JJ. Comparison of fixed and mobile-bearing total knee arthroplasty in terms of patellofemoral pain and function: a prospective, randomised, controlled trial. *BMC Musculoskeletal Disorders.* 2017;18:279.
5. Booth RE Jr. The gender specific (female) knee. *Orthopaedics.* 2006;29:768-769.
6. Kim YH, Kim JS, Choe JW, Kim HJ. Long-term comparison of fixed-bearing and mobile-bearing total knee replacements in patients younger than fifty-one years of age with osteoarthritis. *J Bone Joint Surg Am.* 2012;94(10):866-873.
7. Cram, Peter, et al. Total knee arthroplasty volume, utilization, and outcomes among Medicare

- beneficiaries, 1991-2010. *JAMA*. 2012;308(12):1227-1236.
8. Parsch D, Krüger M, Moser MT, Geiger F. Follow-up of 11-16 years after modular fixed-bearing TKA. *Int Orthop*. 2009;33(2):431-435.
 9. Freeman MAR, Pinskerova V, The movement of the normal tibiofemoral joint. *J Biomech*. 2005;38(2):197-208.
 10. Hofmann AA, Heithoff SM, Camargo M. Cementless total knee arthroplasty in patients 50 years or younger. *Clin Orthop*. 2002;404:102-107.
 11. Hay GC, Kampshoff J, Kuster MS. Lateral subvastus approach with osteotomy of the tibial tubercle for total knee replacement. *J Bone Joint Surg Br*. 2010;92(6):862-866.
 12. Lima JTKA, Luscombe KLA, Jonesb PWA, Whitea SHA. The effect of preoperative symptom severity on functional outcome of total knee replacement patients with the lowest preoperative scores achieve the lowest marks. *The Knee*. 2006;13(3):216-219.
 13. Pais-Brito JL, Rafols-Urquiza B, Gonzalez-Massieu L, Herrera-Perez M, Aciego-De Mendoza M, De Bergua Domingo J. Reduced patellofemoral and walking pain with mobile-bearing vs. fixed-bearing total knee replacements: a mid-term prospective analytic study. *Acta Orthop Traumatol Turc*. 2015;49(4):375-381.
 14. Jared R.H. Foran, Michael A. Mont, Gracia Etienne, et al., The Outcome of Total Knee Arthroplasty in Obese Patients. *J Bone Joint Surg Am*. 2004;86A(8):1609-1615.
 15. Aglietti, P, Baldini, A, Buzzi, R, Lup, D, De Luca, L. Comparison of mobile-bearing and fixed-bearing total knee arthroplasty: A prospective randomized study. *J Arthroplasty*. 2005;20:145:53.
 16. Losina, Elena, et al. Cost-effectiveness of total knee arthroplasty in the United States: patient risk and hospital volume. *Archives of internal medicine*. 2009;169(12):1113.
 17. Ritter MA. The Anatomical graduated component Total knee Replacement-A Long term evaluation with 20- year survival Analysis. *J Bone Joint Surg*. 2009;91-B(6):745-749.
 18. Nadaud M, Snyder MA, Brown D, Mc Pherron A. New Trends and Early Clinical Outcomes with a modern knee revision system. *Ortho*. 2007;30(8):97-101.
 19. Dowsey MM, Broadhead ML, Stoney JD, Choong PF. Outcomes of total knee arthroplasty in English versus non-English-speaking patients. *J Orthop Surg*. 2009;17(3):305-9.
 20. Li PH, Wong YC, Wai YL. Knee flexion after total knee arthroplasty. *J Orthopa Surgery*. 2007;15(2):149-53.
 21. Vasdev A, Kumar S, Chadha G, Mandal SP. Fixed-versus mobile-bearing total knee arthroplasty in Indian patients. *Journal of Orthopaedic Surgery*. 2009;17(2):179-82.
 22. Pinskerova V, Johal P, Nakagawa S, Sosna A, Williams A, Gedroyc W, Freeman MA, Does the femur roll-back with flexion ? *J Bone Joint Surg Br*. 2004;86(6):925-931.
 23. Berger RA, Lyon JH, Jacobs JJ, et al, Problems with cementless total knee arthroplasty at 11 years follow-up. *Clinical Orthop*. 2001;392:196-207.
 24. Wylde V, Learmonth I, Potter A, Bettinson K, Lingard E. Patient - reported outcomes after fixed versus mobile- bearing total knee replacement. A multi-centre randomised controlled trial using the kinemax total knee replacement. *J Bone Joint Surg Br*. 2008;90(9):1172-1179.
 25. Kim Y-H, Yoon S-H, Kim J-S. Early Outcome of TKA with a Medial Pivot Fixed bearing Prosthesis is worse than with a PFC Mobile-bearing Prosthesis. *Clinical Orthopaedics and Related Research*. 2009;467(2):493-503.
-