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Original Research Article

Study of the Functional Outcome of Total Knee Replacement in A Patient with Severe Osteoarthritis of Knee

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Abstract:

Background: Total knee arthroplasty has revolutionized the care of patients with end stage arthritic conditions. Increasing life expectancy, growing demand and success of this surgery have lead to signicant increase in the number of total knee replacements. The present study was conducted to assess cases of total knee replacement in a tertiary care centre.

Material and Methods: The present prospective study was conducted in the department of Orthopedics. It comprised of 30 patients of both genders in which TKA was performed. A thorough clinical examination and Radiological assessment was performed. All patients were assessed clinically using the Range of Motion and Knee Society Score pre operative and post operative. Statistical analyses were performed using SPSS 20.0. P value less than 0.05 was considered significant.

Results: In the present study total participants were 30 in which 66.67% were male and 33.33% were females. The functional outcome was evaluated using Knee Society Scoring which showed significant increase in KSS at 1,6 and 12 months with improving knee function and patient quality of life over the course of a year

Conclusion: The present study concluded that maximum cases of total knee replacement were in males and functional outcome was excellent in maximum cases.

Keywords: Total knee replacement, clinical outcome, arthroplasty

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Introduction

Osteoarthritis (OA) is a chronic, progressive joint disease-causing significant disability and morbidity, particularly in aging populations [1]. Knee OA is a major contributor to dependency in daily activities like walking and climbing stairs [2]. To address this growing public health issue, preventing OA onset and progression is crucial. Effective prevention lies in addressing modifiable risk factors, including age, genetic predisposition, occupational demands, past joint injuries, and obesity [1].

Knee OA typically presents with recurrent swelling, stiffness, pain, restricted joint motion, and potential angular deformity [4]. Many OA knees exhibit instability, ligamentous laxity, medial joint line tenderness, varus deformity, or contracture [2]. OA is characterized by articular cartilage breakdown and changes in underlying bone [3]. It can be unicompartmental, bicompartmental, or tricompartmental, depending on the affected knee compartments.

Diagnostic imaging includes X-rays (standing anteroposterior, lateral, and skyline views), scannograms (plain radiographs of hip, knee, and ankle joints), magnetic resonance imaging (MRI), arthrography, high-frequency color ultrasound, and thermal texture maps [7]. These examinations diagnose OA, assess joint damage severity, and determine suitable treatment options [5,6].

Treatment options depend on OA severity. Traditional medicines include nonsteroidal anti-inflammatory drugs and articular cartilage protection drugs like glucosamine and chondroitin sulphate. Non-surgical options include intra-articular injections (corticosteroids and hyaluronic acid), offloading braces, and arthroscopic debridement. Surgical options include cartilage repair techniques (bone marrow stimulation, osteochondral allograft transplantation), high tibial osteotomy (for younger patients), and joint replacement (unicompartmental or total knee arthroplasty) [8].

Choosing the most appropriate treatment approach depends on OA severity, patient age and activity level, and potential risks and benefits [7]. Total knee arthroplasty is indicated for end-stage arthritis, typically tricompartmental knee OA. Studies show total knee arthroplasty decreases pain and improves mobility, enhancing quality of life [Carr AJ]. Pre-operative investigations, pre-surgical physiotherapy, and templating optimize outcomes. Achieving neutral limb alignment is crucial for successful total knee replacement, using conventional radiographs and scannograms [Dr. Sachin et al.].

Materials And Methodology

Study Design and Objectives

This prospective observational study aims to evaluate the clinical and functional outcomes of Total Knee Arthroplasty (TKA) in patients with severe osteoarthritis. The study will be conducted at a tertiary care hospital over 18 months.

Methodology

Patients above 45 years with grade 3 or more osteoarthritis will be included. Sample size is determined by simple random sampling, with 30 patients selected based on prevalence from previous studies[9]. Patients with severe comorbidities, psychiatric illness, infective arthritis, deep vein thrombosis, or unwilling to provide consent will be excluded.

Data Collection and Analysis

Data will be collected using a case performa, including socio-demographic profiles, medical history, and laboratory reports. Radiological evaluations will assess knee alignment, deformities, and ligamentous instability. Surgical procedures will follow standard protocols. Post-operative outcomes will be assessed using the Knee Society Scoring (KSS) system.

Surgical Procedure

TKA will be performed under tourniquet control using an anterior midline approach. Femoral and tibial components will be prepared, and ligamentous balancing will be achieved. Component implantation will follow standard guidelines.

Post-Operative Protocol

Patients will undergo compression bandaging, epidural analgesia, and antibiotic prophylaxis. Continuous passive motion (CPM) will be initiated, and quadriceps strengthening exercises will begin on post-operative day 1.

Complications

Potential complications include periprosthetic infection, aseptic loosening, polyethylene wear, osteolysis, metallosis, instability, dislocation, and periprosthetic fracture.

Outcome Measures

Primary outcomes will be evaluated using the KSS system at 1, 6, and 12 months. Secondary outcomes will include assessment of knee function, pain, and patient satisfaction.

Statistical Analysis

Data will be analyzed using IBM SPSS Ver. 26.0.0.0. Descriptive statistics will be presented, and comparative analysis will be performed using chi-square tests and independent sample t-tests.

This study aims to provide valuable insights into the effectiveness of TKA in geriatric patients with severe osteoarthritis, guiding healthcare professionals in optimizing treatment outcomes.

Result

In the present study total participants were 30 in which 66.67% were male and 33.33% were females. The Study tracks the mean ROM pre-operatively (PRE-OP) and at 1 month, 6 months, and 12 months post-surgery for 30 patients (N=30). Initially, the overall mean ROM is 80 degrees with a standard deviation (SD) of 9.5 degrees. At 1-month post-surgery, the mean ROM improves to 100 degrees with an SD of 7.4 degrees. By 6 months, the mean ROM further increases to 115 degrees with an SD of 7.2 degrees, and at 12 months, the mean ROM reaches 120 degrees with an SD of 7.2 degrees. This data indicates a significant and steady improvement in ROM over time, with the greatest gains occurring within the first 6 months post-surgery. This trend demonstrates the effectiveness of the surgical intervention in enhancing patients' ROM, contributing to improved mobility and quality of life over time. This improvement is statistically significant, indicated by a p-value of less than 0.01.

Sr No	Parameters	Statistics	Pre-Op	1 Months	6 Months	12 Months
1	**OVERALL ROM**	MEAN	80	100	115	120
2	**N=30**	STD. DEVIATION	+9.5	+7.4	+7.2	+7.2
	P value < 0.01					

The trends in the Knee Society Score (KSS) for severe osteoarthritis patients over various time periods, highlighting the statistical relationship of these trends. The table records the mean KSS pre-operatively (PRE-OP) and at 1 month, 6 months, and 12 months post-surgery for a cohort of 30 patients (N=30). Initially, the mean KSS is 42 with a standard deviation (SD) of 3.5. At 1-month post-surgery, the mean KSS rises to 76 with an SD of 3.5, indicating a substantial improvement. By 6 months, the mean KSS further increases to 84, accompanied by a reduced SD of 3.2, suggesting a more uniform improvement among the patients. At 12 months, the mean KSS reaches 92, with an SD of 2.3, showing continued progress. These results demonstrate a significant and steady enhancement in the KSS over time, with the most notable improvements occurring within the first 3 months. The decreasing SD at 6 and 12 months implies that patients are achieving more consistent outcomes during this period. Overall, the data underscores the effectiveness of the treatment in improving knee function and patient quality of life over the course of a year. This improvement is statistically significant, indicated by a p-value of less than 0.01.

Sr no	Parameters	Statistics	Pre-op	1 months	6 Months	12 months
1	**Overall KSS**	Mean	42	76	84	92
2	**N=30**	Std. Deviation	+3.5	+3.5	+3.2	+2.3
	P Value	< 0.01				

Discussion

Nowadays, total knee arthroplasty is becoming a standard treatment for arthritic knee in terms of relief from knee pain free as well as it stabilizes the knee with an appropriate range of motion and associated with substantial functional improvement. Significant advances have occurred in the type and quality of the metals, polyethylene, and, more recently, ceramics used in the prosthesis manufacturing process, leading to improved longevity. As with most techniques in modern medicine, more and more patients are receiving the benefits of total knee arthroplasty (TKA) [10, 11]. In the present study total participants were 30 in which 66.67% were male and 33.33% were females. The functional outcome was assessed with Knee Society Score and ROM of the knee. The study showed excellent outcome with significant increase in ROM and Knee Society Scoring. TKRs are reported to relieve pain and improve mobility, the best published results reporting a ‘good’ or ‘excellent’ outcome in approximately 90% of patients [12]. A total knee arthroplasty is the surgical removal of the diseased joint and replacement with a metal hinge joint (prosthesis) that is attached to the thigh bone (femur) and the shinbone (tibia) [12]. In the study conducted by Farahini *et al*. significant improvement in knee society score was observed [13]. A study conducted by Yaratapalli *et al*. showing increased in Knee society score after TKA [14]. Kadam *et al*. conducted a study conducted a prospective analysis of 40 cases of osteoarthritis knee patients at a tertiary care centrein Mumbai over a period of two years. Those patients who underwent total knee arthroplasty were assessed clinically and functionally using knee society score. The mean preoperative knee clinical score (KCS) was 49.40±13.79 which was increased to a postoperative score of 86.08±5.64 at the end of 6 month. Similarly, the mean preoperative knee functional score (KFS) was 32.75±11.79 which was increased to a postoperative score of 84.43±9.59 at the end of 6 month. There was significant increase in KCS and KFC score during follow up at 1, 3 and 6 month interval. There was significant association between knee functional score and knee clinical score at every interval [15].

Conclusion

This study with these findings collectively demonstrates significant improvements in range of motion, knee functionality, pain reduction, leading to enhanced physical capabilities after Total Knee Replacement Operation. Thus, Total Knee Replacement improves the functional outcome in a patient with severe osteoarthritis of knee.

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