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ORIGINAL ARTICLE

Functional Outcome of Total Knee Replacement in Patients with Osteoarthritis Attending Bolan Medical Complex Hospital Quetta

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ABSTRACT

Introduction: Total Knee Arthroplasty (TKA) is an efficient therapeutic option for symptomatic osteoarthritis of the knee that has not improved with conservative treatments. Research has yet to uncover a potentially effective alternative for cartilage regeneration in patients experiencing end-stage degenerative changes that diminish the articular cartilage in various parts of the knee.[1] This study is designed to corroborate the outcomes of previous research, and therefore, the same treatment modality will be applied in future cases of patients with osteoarthritis.

Objective: To determine the functional outcome of total knee replacement in patients with osteoarthritis presenting at Bolan Medical Complex Hospital Quetta**.**

Study Setting: This descriptive study was conducted at department of Orthopedic Sugary, Bolan Medical Complex Hospital Quetta from 10 March, 2022 to 10 June 2023

Methodology: This study was conducted on seventy one patients of both genders male and female having age between 40 to 65 years diagnosed with osteoarthritis with duration of OA one or more years. The functional outcome of Total Knee Replacement was determined.

Results: This study was conducted on 71 patients diagnosed with osteoarthritis. The mean age of the patients was 52.10±7.33 years. According to the functional outcome 18 (25.4%) patients had excellent outcome, 46 (64.8%) had good, 4 (5.6%) had fair and 3 (4.2%) had poor functional outcome.

Conclusion: From our study we conclude that the functional outcome of Total Knee Replacement in patients with osteoarthritis was excellent in 25.4%), good in 64.8%), fair in 5.6% and poor in 4.2% patients.

Keywords: Osteoarthritis, Total Knee Replacement, Functional outcome, Arthritis

INTRODUCTION

Total Knee Arthroplasty (TKA) represents a highly effective treatment option for patients suffering from symptomatic osteoarthritis of the knee that has not responded to conservative therapies. Current research has not yet identified a viable alternative for cartilage regeneration in individuals with advanced degenerative changes that compromise the articular cartilage in various regions of the knee. Consequently, TKA has demonstrated consistent, long-term advantages for these patients, particularly in alleviating pain and enhancing overall quality of life.[1] According to recent estimates, it is projected that 3.48 million TKAs will be performed annually by the year 2030.[2] Despite the widespread and increasingly routine nature of TKA surgery, meticulous attention to detail during the procedure is crucial to ensure that a well-balanced and effective TKA is achieved, thereby minimizing the risk of premature wear of the implanted components. Even with the implementation of optimal techniques, advancements in technology, and a greater understanding of knee kinematics, approximately 20% of patients who undergo TKA report dissatisfaction.[3,4] There exists a variety of TKA designs and levels of constraints that may be suitable for particular clinical situations. Alternative options for the initial surgical procedure may include unicompartmental arthroplasty, cruciate-retaining designs, and posterior-stabilized implants. More constrained prosthetic options are typically considered for patients exhibiting significant varus or valgus instability, those undergoing revision surgeries that involve component changes, individuals with poor bone quality, or those presenting with notable osseous deformities. These options encompass semi-constrained, hinged, and distal femoral replacement techniques, among others.[5]

The most prevalent form of arthritis globally is osteoarthritis, which consists of two types: primary osteoarthritis and secondary osteoarthritis. Osteoarthritis generally presents as joint pain and a loss of functionality; however, the condition can range from being an asymptomatic incidental finding to a severely debilitating and permanently crippling disorder.[6] Age, gender, obesity, anatomical features, muscular weakness, and joint damage are all recognized risk factors for osteoarthritis. The primary type of osteoarthritis is the most common, identified without a preceding event or disease, yet associated with the aforementioned risk factors. Secondary osteoarthritis arises from a history of joint issues.[7] Conditions such as trauma, inflammatory arthritis, metabolic disorders, avascular necrosis, congenital joint disorders, and infectious arthritis serve as predisposing factors. A study indicated that the postoperative functional outcomes of total knee replacement in patients with osteoarthritis revealed excellent results in 24.1% of patients, good in 62.3%, fair in 6.8%, and poor in 6.8%.[8] The mean preoperative knee clinical score (KCS) was 49.40±13.79, which improved to a postoperative score of 86.08±5.64 after six months. Likewise, the mean preoperative knee functional score (KFS) was 32.75±11.79, which increased to a postoperative score of 84.43±9.59 at the six-month mark. There was a significant improvement in both KCS and KFS scores during follow-ups at one, three, and six-month intervals.[9] The average Knee Injury and Osteoarthritis Outcome Score was 77 points (ranging from 14 to 100), with 90% of patients expressing satisfaction with the procedure.[10]

Osteoarthritis represents the most widespread type of arthritis, affecting a large population worldwide. This condition develops when the protective cartilage that cushions the ends of the bones gradually breaks down. It is deemed the most common ailment that leads to knee replacement surgery. The purpose of the study is to validate the findings of previous studies; thus, the same approach will be utilized in future cases involving patients with osteoarthritis.

METHODOLOGY

The study was initiated following the approval from the hospital's ethics committee. Participants who satisfied the inclusion criteria were included in the research. Patients were informed about the study's objectives, risks, and benefits, and were requested to sign a written informed consent form. The demographic information of the patients, including gender, age, duration of complaint, height, weight, BMI (calculated using the formula weight in kg divided by height in meters squared), and their history of diabetes and hypertension, was recorded. The surgical procedure was

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performed by a consultant with three or more years of experience. Standard treatment protocols were adhered to, and periodic follow-ups will be conducted. The functional outcome was evaluated three months after the procedure, as described in the operational definition.

SPSS version 23 software was utilized for data entry and analysis. The normality of the data was assessed using the Kolmogorov-Smirnov test. The Mean plus Standard Deviation or Median Interquartile Range, as appropriate, were presented for numerical data such as age, duration of complaint, weight, height, and BMI. Frequencies and percentages were reported for categorical data including gender, diabetes, hypertension, functional outcome, and acceptable outcome. The functional outcome was stratified by gender, age, diabetes, hypertension, duration of complaint, and BMI to address the effect modifiers. A chi-square or Fisher's exact test was performed post-stratification at a significance level of 5%. All results will be presented in tabular form.

RESULTS

This study was conducted on 71 patients diagnosed with osteoarthritis. The mean age of the patients was 52.10±7.33 years. The mean duration of complaint was 5.24±2.56 years. The mean height was 1.64±0.03 meter. The mean weight was 77.99±5.75 kg and the mean BMI was 28.94±2.61 kg/m^2 (Table 1).

According to age distribution there were 31 (43.7%) patients in the age group of 40 to 50 years and there were 40 (56.3%) patients in the age group of 51 to 65 years. According to gender distribution there were 44 (62%) male while 27 (38%) female patients in our study. The frequency of diabetes in our study was 24 (33.8%). The frequency of hypertension in our study was 17 (23.9%). According to the functional outcome 18 (25.4%) patients had excellent outcome, 46 (64.8%) had good, 4 (5.6%) had fair and 3 (4.2%) had poor functional outcome. In our study we observed that the 64 (90.1%) was acceptable outcome. (Table 2).

Stratification of functional outcome with age, gender, diabetes, hypertension, duration of complaints and BMI can be seen from table no 3.

Table 1: Descriptive statistics (n = 71)

Variables	Mean	Std. Deviation
Age (Year)	52.10	7.335
Duration of complaint(Year)	5.24	2.560
Height (Meter)	1.6427	.03194
Weight (Kg)	77.99	5.758
BMI (Kg/m^2)	28.9496	2.61017

Table 2: Age distribution, Gender distribution, Frequency of diabetes, Frequency of hypertension, Functional outcome and Acceptable outcome

Age distribution	Frequency	Percent
40 to 50 years	31	43.7
51 to 65 years	40	56.3
Gender distribution		
Male	44	62.0
Female	27	38.0
Diabetes		
Yes	24	33.8
No	47	66.2
Hypertension		
Yes	17	23.9
No	54	76.1
Functional outcome		
Excellent	18	25.4
Good	46	64.8
Fair	4	5.6
Poor	3	4.2
Total	71	100.0
Acceptable outcome		
Yes	64	90.1
No	7	9.9
Total	71	100.0

Table 3: Stratification of functional outcome with age, gender, diabetes, hypertension, duration of complaints and BMI

		Age distribution		Total	P value
		40 to 50 years	51 to 65 years		
Functional outcome	Excellent	12 66.7%	6 33.3%	18 100.0%	0.05
	Good	18 39.1%	28 60.9%	46 100.0%	
	Fair	0 0.0%	4 100.0%	4 100.0%	
	Poor	1 33.3%	2 66.7%	3 100.0%	
Gender	Excellent	11 61.1%	7 38.9%	18 100.0%	0.96
	Good	29 63.0%	17 37.0%	46 100.0%	
	Fair	2 50.0%	2 50.0%	4 100.0%	
	Poor	2 66.7%	1 33.3%	3 100.0%	
Diabetes	Excellent	5 27.8%	13 72.2%	18 100.0%	0.17
	Good	14 30.4%	32 69.6%	46 100.0%	
	Fair	3 75.0%	1 25.0%	4 100.0%	
	Poor	2 66.7%	1 33.3%	3 100.0%	
Hypertension	Excellent	3 16.7%	15 83.3%	18 100.0%	0.85
	Good	12 26.1%	34 73.9%	46 100.0%	
	Fair	1 25.0%	3 75.0%	4 100.0%	
	Poor	1 33.3%	2 66.7%	3 100.0%	
Duration of complaints (Years)	Excellent	7 38.9%	11 61.1%	18 100.0%	0.46
	Good	25 54.3%	21 45.7%	46 100.0%	
	Fair	3 75.0%	1 25.0%	4 100.0%	
	Poor	1 33.3%	2 66.7%	3 100.0%	
BMI distribution	Excellent	12 66.7%	6 33.3%	18 100.0%	0.43
	Good	26 56.5%	20 43.5%	46 100.0%	
	Fair	2 50.0%	2 50.0%	4 100.0%	
	Poor	3 100.0%	0 0.0%	3 100.0%	

DISCUSSION

Total Knee Replacement (TKR), also referred to as total knee arthroplasty, is a surgical intervention that has demonstrated significant effectiveness in enhancing the functional outcomes and quality of life for individuals afflicted with end-stage knee osteoarthritis (OA). Osteoarthritis is a degenerative joint condition marked by the deterioration of cartilage within the knee joint, resulting in pain, stiffness, and diminished mobility. When conservative treatment methods fail to yield relief, TKR emerges as a feasible option to alleviate symptoms and restore functionality.[11]

Proximal tibial fractures are relatively frequent orthopedic injuries that can ultimately lead to the onset of posttraumatic osteoarthritis (POA) in the knee. Key risk factors for POA include direct intraarticular injury, insufficient reduction or fixation of the fracture, residual malalignment, younger patients, and prior joint degeneration. The literature reports a wide variation in the prevalence of POA, ranging from 21% to 44%.[12] The advanced stage of this secondary osteoarthritis typically develops after an average delay of 7 years (with a range of 2 to 11 years) following the initial injury. Nevertheless, a recent study indicated that the incidence of severe POA requiring reconstructive surgery at the

10-year mark was 4% among operatively treated tibial plateau fractures and 7% among those treated nonoperatively.[13]

Severe post-traumatic osteoarthritis (POA) resulting from a prior knee fracture is a criterion for total knee arthroplasty (TKA). Published studies indicate that patients with POA who undergo TKA experience poorer outcomes and a higher rate of complications compared to those who receive routine primary TKA.[14] The underlying causes of these unfavorable outcomes are likely multifaceted, including increased technical challenges. Performing TKA on these patients may pose various technical difficulties for the surgeons, which are associated with malalignment, bony deficiencies, joint instability, post-traumatic stiffness, previous hidden infections, soft tissue compromise due to scarring, and the presence of retained internal fixation devices. Nevertheless, the technical challenges encountered in TKA for POA resulting from proximal tibial fractures often resemble those faced in revision surgeries, including loss of bone stock, although the complication rate reported in revision TKA is comparatively lower. The complication rate associated with revision TKA is indeed lower.[15] TKA is a frequently performed procedure for osteoarthritis following fractures around the knee joint; however, there is a scarcity of studies examining its outcomes. Most of these studies are limited in size due to the low incidence of such cases and typically involve short-term follow-ups. Furthermore, they often include a mix of distal femur and proximal tibia fractures. Other studies have concentrated on a diverse population, such as the outcomes of TKA for POA in instances of extraarticular malunions, previous infections, or patients with pre-existing limitations in flexion.[16]

The literature describing the outcomes of TKA for POA is limited.[17] There have been few studies detailing the complexity and the outcomes of TKA after tibial plateau fracture, and none was prospective. Several studies on TKA after fractures around the knee, although combining tibial and femoral fractures, reported that the higher complication rate compared to routine TKA could be due to diverse factors, such as deficiencies in bone stock, compromised soft tissue envelope, multiple prior surgeries, possible occult infection present before TKA, limited motion, and residual limb or component malalignment. Simultaneous TKA and removal of hardware may require more than one incision for adequate exposure which increases the risk of soft tissue necrosis and septic contamination.[18]

In a study on 62 TKA following tibial plateau fractures, a study reported that 3 (4.8%) knees necessitated wound revision for wound breakdown with one of them requiring coverage with a gastrocnemius flap. Conversely, a study reported no cases of skin necrosis in a review of 15 patients. Previous fracture surgery has been described as a risk factor of infection after total knee arthroplasty.[19] A study of logistic regression analysis reported that previous fracture and remnants of internal fixation material were predictor of infection after TKA, but the authors studied only 17 infected TKA. In a retrospective matched study, the major infection risk for infection of TKA performed after tibial plateau fracture was previous infected surgery for treatment of the fracture. Another study reported a 3% of superficial infection and other 3% of deep infection. A different study found an infection rate of 20%. We believe that previous hardware removal can improve revascularization of soft tissues and reduce time of surgery and the likelihood of surgical contamination.[20]

Concerning the functional results of total knee replacement (TKR) in our research, we observed that 18 patients (25.4%) achieved an excellent outcome, 46 patients (64.8%) had a good outcome, 4 patients (5.6%) experienced a fair outcome, and 3 patients (4.2%) demonstrated a poor functional outcome. Our findings are comparable to another study that reported the postoperative functional outcomes of total knee replacement in patients suffering from osteoarthritis, where 24.1% of patients had excellent outcomes, 62.3% had good outcomes, 6.8% had fair outcomes, and 6.8% had poor outcomes.[8]

CONCLUSION

From our study we conclude that the functional outcome of total knee replacement in patients with osteoarthritis was excellent in 18 (25.4%), good in 46 (64.8%), fair in 4 (5.6%) and poor in 4.2% patients.

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