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ORIGINAL ARTICLE

Long Term Outcomes of Single Staged Sequential Bilateral Total Knee Replacement in Patients Aged 60 Years or Above

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ABSTRACT

Objective: To determine the long-term outcomes of single staged bilateral total knee arthroplasty in patients of geriatric age group.

Methods: This single-center retrospective study was carried out at Liaquat National Hospital Karachi, Pakistan. Data of 2001 to 2010 were retrieved from the medical records. All geriatric age group patients above 60 years irrespective of comorbidity status, underwent single-stage bilateral total knee arthroplasty were consecutively included. Pre-operative diagnoses such as primary osteoarthritis, post-traumatic arthritis and rheumatoid arthritis were noted. The minimum follow-up time period was 10 years. Long term outcome such as knee society score, adverse event, and need of revision surgery were noted.

Results: Of 96 patients, the median age was 69.0 (65.0-76.0) years. There were 44 (45.8%) males and 52 (54.2%) females. Primary osteoarthritis was the most common primary diagnosis, i.e., 66 (68.8%) followed by rheumatoid arthritis in 24 (25.0%), and post-traumatic arthritis in 6 (6.3%) patients. Most of the patients had moderate Charlson Comorbidity Index score, i.e., 70 (72.9%) while Knee Society Score showed that 41 (40%) reported excellent outcome. Need of revision surgery was reported by 6 (6.3%) patients. Adverse events were reported by 11 (11.5%) patients. A significant median difference of Knee Society Score was found among patients with diabetes mellitus (p-value <0.001) and pre-operative diagnosis (p-value <0.001).

Conclusion: The long-term outcome of patients underwent bilateral total knee arthroplasty was found satisfactory. It is likely that total knee arthroplasty is widely regarded as the best option for treating end-stage knee osteoarthritis.

Keywords: Arthroplasty, Adverse Effects, Knee, Long Term, Replacement.

INTRODUCTION

Osteoarthritis is anticipated to affect the majority of the elderly population, with around one-third of patients presenting to the surgeon with bilateral complaints.[1,2] Multiple illnesses, for example, osteoarthritis, rheumatoid joint inflammation, and hemophilia can bring about serious reciprocal knee decimation.[3,4] Many of them require surgery on both knees before achieving their full ambulatory potential.[1]

Bilateral total knee arthroplasty can be performed at the same time under an equivalent anesthesia or as organized techniques, with 2 one-sided knee arthroplasties under discrete sedatives and hospitalizations.[5] Synchronous bilateral total knee arthroplasty has been depicted as a protected and advantageous methodology related with higher patient fulfillment, quicker recuperation, and lower costs.[6] Despite this, studies have shown that simultaneous bilateral total knee arthroplasty causes more complications, such as increased intraoperative blood loss, a greater need for perioperative blood transfusions, increased rates of venous thrombo-embolism, cardiorespiratory difficulties, neurologic confusions, wound profound disease, and mortality. Hence, the advantages of one-phase bilateral knee replacement include lessened hospitalization, decrease in cost, and need for one-time anesthesia.[7,8] These advantages are in the best interest of the patient if the system is as sheltered as one-sided substitution.

The rationale for this study is that, like in any other region, total knee arthroplasty is a well-established and expected operation in orthopedic surgery in Pakistan, and it is widely available in all major tertiary care facilities. Taking into consideration the outcome of total knee arthroplasty, in particular, functional

outcome of bilateral total knee arthroplasty, findings from Pakistan is scarce. This study is therefore planned to report the ten years' experience of a private tertiary care hospital and analyze the outcomes of single staged bilateral total knee arthroplasty in patients of geriatric age group.

METHODS

This single-center retrospective study was carried out at the Liaquat National Hospital, Karachi, Pakistan. Data of 2001 to 2010 were retrieved from the medical record. Institutional approval was obtained from the Ethical Review Committee of Liaquat National Hospital prior conducting of the study.

The inclusion criteria were geriatric age group patients above 60 years age presented with irrespective of comorbidity status, underwent single-stage bilateral total knee arthroplasty. All these patients had disabling bilateral knee arthropathy. Those who lost to follow-up or died were excluded. A total of 5% of the patients lost to follow-up whereas mortality was reported in 30% of the patients. Thus, a total of 96 patients who underwent single-stage bilateral total knee arthroplasty during the study period were included.

Preoperative anesthetic consultation was offered one month before to the surgery, as per the institutional practice. The American Society of Anesthesiology (ASA) score was also used to estimate the surgical risk of the patients. Surgery was performed by one group of surgeons having 15 years of experience. In all cases only primary implants were used and all were posterior stabilized (PS) with a poly. The standard medial parapatellar approach is used. After the arthrotomy has been completed and the patella has been everted, an intramedullary drill is used to provide access to the femoral canal so that a distal femoral intramedullary jig can be used. The angle selected on the guide usually yields 5 or 7 degrees of valgus, and the distal femur was resected for 9-10 mm.

A perpendicular tibial cut was done using an extramedullary guide on the proximal tibia. The ankle joint is rotated by reference the medial one-third of the tibial tubercle and a position somewhat medial to the center. The second ray of the foot and the tibial crest are also used to reference this alignment. A spacer block was used to check the extension and flexion gap after the tibial cut was completed. Anterior and posterior chamfer cuts are made after a satisfactory check and balancing. Retractors were used to protect the collateral soft tissue structures. A provisional spacer trial was implanted after the femoral and tibial trial implants were impacted. From 0 degrees of extension to mid-flexion stability, the knee was decreased and tested for stability. Patellar excision and patellar implant were performed to resurface the patella. Resections that were too big or too little were avoided.

Before the final implant was put, the stability parameters were double-checked. Layers of stitches were used to close the wound. Arthrotomy, deep fascial, and deep dermal/subcutaneous layers were all treated with Vicryl 2/0. Staples were used for the skin. Then, for the first five days, a sterile dressing was applied and remained in place without being changed.

Pre-operative diagnoses such as primary osteoarthritis, post-traumatic arthritis and rheumatoid arthritis were noted. The follow-up time period was 10 years.

Demographic data and presence of comorbidities along with the year of surgery performed were noted. In addition, Charlson Comorbidity Index was also noted. Charlson Comorbidity Index is a validated measure that has been used to predict survival and outcome of different medical treatments, as well as for estimating the risk of post-operative complication and mortality in orthopedic patients.[9] Based on the Charlson Comorbidity Index score, the severity of comorbidity was categorized into three grades: mild (1–2 score), moderate (3–4), and severe (≥5).[10] Long term outcome in terms of Knee Society Score, adverse event and need of revision surgery were also noted. Knee Society Score was created to give a simple and objective scoring system for evaluating the knee and patient's functional abilities before and after total knee arthroplasty. Knee society score ranges from 0-100. Those who scored 80-100 were labeled as excellent, 70-79 as good, 60-69 as fair, while below 60 as poor.[10]

Data entry and analysis were done using a Statistical Package for Social Sciences (SPSS) version 20.0. Median (IQR) were computed for quantitative variables like, age (years), while frequency and percentages were computed for categorical variables like, gender, comorbidities, Knee Society Score, pre-operative diagnosis, Charlson Comorbidity Index, adverse events, and need of revision surgery. Inferential statistics were explored using Mann-Whitney and Kruskal–Wallis test for comparison of knee society score with baseline and clinical characteristics. The p-value of ≤ 0.05 was considered statistically significant.

RESULTS

Of total 96 patients, the median age was 69.0 (65.0-76.0) years. There were 44 (45.8%) males and 52 (54.2%)

females. The outcome Knee Society Score showed that most of the patients reported excellent outcome 41 (40%), while 28 (29.2%) reported good outcome and very few reported fair 16 (16.7%) and poor outcome 11 (11.5%). Primary osteoarthritis was the pre-operative diagnosis observed in 66 (68.8%) patients, rheumatoid arthritis in 24 (25.0%), and post-traumatic arthritis in 6 (6.3%) patients. The presence of comorbidities showed that diabetes mellitus was reported by 56 (58.3%) patients, hypertension by 38 (39.6%), ischemic heart disease 21 (21.9%). Charlson Comorbidity Index showed that majority of the patients had moderate Charlson score, i.e., 70 (72.9%), 14 (14.6%) had mild score, and 12 (12.5%) had severe score.

A significant median comparison of Knee Society Score was found with diabetes mellitus (p-value <0.001) and pre-operative diagnosis (p-value <0.001). While pair wise comparison of pre-operative diagnosis showed a significant median difference of Knee Society Score was found among patients with diabetes mellitus (p-value <0.001) and pre-operative diagnosis (p-value <0.001), (Table 1).

Adverse events were reported by 11 (11.5%) patients. Of these 11 patients' majority of the patients were from 64-76 years of age, having history of comorbidities, moderate Charlson Comorbidity Index, their pre-operative diagnosis was primary osteoarthritis, mostly good or excellent Knee Society Score and they did not need of revision surgery. (Table 2) Need of revision surgery was reported by 6 (6.3%) patients. Out of which, 3 (50.0%) were periprosthetic fractures and 3 (50%) were due to aseptic loosening. Characteristics of these patients were reported in table 3.

DISCUSSION

In the current study, long-term outcome of patients who had primary total knee replacement were reported and overall implant survivorship, revision surgery, Knee Society Score, and adverse outcome as the end point.

Total knee arthroplasty is a well-established and well-anticipated orthopaedic surgical treatment.[11-13] According to the current study findings, Knee Society

Table 1: Comparison of knee society score with baseline and clinical characteristics (n = 96)

	Knee Society Score		
	Median (IQR)	**95% C.I**	**p-value**
Age, Years			
≤ 70	78.0 (68.5-89.5)	74.1 to 81.3	0.616$^{€}$
> 70	77.0 (64.0-89.0)	71.1 to 80.4	
Gender			
Male	77.0 (64.5-90.7)	71.9 to 81.0	0.982$^{€}$
Female	78.0 (67.0-89.0)	73.4 to 80.8	
Pre-Operative Diagnosis			
Primary Osteoarthritis	72.0 (62.0-83.7) [a]	69.2 to 76.0	<0.001^{*λ}
Rheumatoid Arthritis	90.0 (88.0-92.5) [ab]	85.7 to 92.1	
Post-traumatic Arthritis	74.5 (72.5-77.2) [b]	71.7 to 77.5	
Hypertension			
Yes	81.5 (75.2-89.0)	79.1 to 84.3	0.016$^{*€}$
No	71.5 (60.7-89.0)	69.4 to 77.8	
Diabetes Mellitus			
Yes	87.5 (76.2-90.7)	79.2 to 85.6	<0.001$^{*€}$
No	65.5 (60.0-76.0)	64.8 to 73.1	
Ischemic Heart Disease			
Yes	76.0 (71.0-78.0)	73.1 to 77.5	0.308$^{€}$
No	83.0 (63.0-90.0)	73.7 to 80.8	

C.I: Confidence interval, IQR: Inter quartile range, a= Primary osteoarthritis vs. rheumatoid arthritis,
b= Rheumatoid arthritis vs. post-traumatic arthritis $^{€}$Mann-Whitney and ^{λ}Kruskal–Wallis test applied, *p-value ≤ 0.05

Table 2: Characteristics of patients who reported adverse events (n=11)

S. No	Age, years	Gender	DM	HTN	IHD	CCI	Pre-Operative Diagnosis	KSS Score	Need of Revision Surgery
1	64	Female	No	No	No	Mild	Primary Osteoarthritis	Poor	No
2	65	Male	No	No	Yes	Mild	Primary Osteoarthritis	Good	No
3	62	Male	Yes	Yes	Yes	Moderate	Primary Osteoarthritis	Good	Yes
4	65	Female	Yes	Yes	Yes	Moderate	Primary Osteoarthritis	Good	No
5	65	Female	No	No	No	Moderate	Primary Osteoarthritis	Fair	No
6	68	Female	Yes	No	No	Moderate	Rheumatoid Arthritis	Excellent	No
7	69	Female	Yes	Yes	No	Moderate	Primary Osteoarthritis	Excellent	No
8	69	Female	Yes	Yes	No	Moderate	Rheumatoid Arthritis	Excellent	No
9	70	Female	Yes	No	No	Moderate	Primary Osteoarthritis	Excellent	No
10	73	Female	Yes	Yes	Yes	Moderate	Primary Osteoarthritis	Excellent	Yes
11	76	Female	No	No	No	Moderate	Primary Osteoarthritis	Good	No

DM: Diabetes mellites, HTN: Hypertension, IHD: Ischemic Heart Disease, KSS: Knee Society Score, CCI: Charlson Comorbidity Index

Table 3: Characteristics of patients who reported need of revision surgery (n=6)

S. No	Age, years	Gender	DM	HTN	IHD	CCI	Pre-Operative Diagnosis	KSS Score	Adverse Events
1	62	Male	Yes	Yes	Yes	Moderate	Primary Osteoarthritis	Good	Yes
2	73	Female	Yes	Yes	Yes	Moderate	Primary Osteoarthritis	Excellent	Yes
3	62	Female	Yes	Yes	Yes	Mild	Primary Osteoarthritis	Good	No
4	73	Male	Yes	No	No	Moderate	Rheumatoid Arthritis	Excellent	No
5	73	Male	No	No	No	Moderate	Primary Osteoarthritis	Poor	No
6	80	Female	Yes	No	No	Moderate	Rheumatoid Arthritis	Excellent	No

DM: Diabetes Mellites, HTN: Hypertension, IHD: Ischemic Heart Disease, KSS: Knee Society Score, CCI: Charlson Comorbidity Index

Figure 1: A 63-year-old female known case of diabetes presented with bilateral knee pain for 6 years. She is unable to walk and weight bear on bilateral knees. She was diagnosed with oeteoarthritis. Xray shows preoperative and postoperative images in anterio-posterior and lateral view.

score showed that excellent and good outcome was reported by majority of the patients.

In a study by Gabr et al[14], it was reported that patients who underwent staged bilateral total knee arthroplasty and had their second knee replaced had a shorter hospital stay than those who had their first knee replaced. Furthermore, the author said that these patients' walking skills, usage of walking aids, and psychological well-being continue to improve following the second treatment.[14] Another study by Kundu et al has reported that in patients with advanced osteoarthritis, the outcomes of both simultaneous and phased bilateral total knee replacement are comparable.[15]

The current study findings showed that need of revision surgery was reported by 6.3% of the patients. Moreover, half these patients who had revision surgery had periprosthetic fractures while remaining half had aseptic loosening. Patients younger than 55 years old had a two-fold greater rate of revision total knee arthroplasty, according to Paxton et al.[16] Though It is now well accepted that total knee arthroplasty is a good treatment for pain relief and restoration of function in patients with advanced degenerative disease hence majority of patients opt for a single stage while some of the patients prefer staged procedure owing to comorbids and associated morbidity of long procedure. In the staged procedure second knee could be replaced at varying intervals following the original surgery. This may be within the same hospital admission, a week apart or at 3 months, 6 months or longer.

Adverse events were documented in 11.5 percent of the individuals in the current trial. Furthermore, during the final follow-up, none of the patients who had not undergone revision surgery showed radiological loosening. None of the patients had received revision surgery at the time of follow-up, according to Trojani et al, despite the fact that two of them had a patellar subluxation and two others had frontal laxity without instability.[17]

There is a paucity of published research on the clinical outcomes and long-term outcomes of total knee arthroplasty in young and active patients, the majority of which uses older knee implant designs.[18] Several studies have reported that in the coming years, it is expected that an increasing number of papers will be published, indicating that total knee arthroplasty research is progressing rapidly. In the field of total knee arthroplasty, in particular, a tendency of balanced development may occur, coupled with intrinsic changes in hotspots in each sub-orientation.[12,19,20]

The limitation of our study is that as this study is a retrospective study, certain important predictor has been missed and not reported. Secondly, as compared to previous studies, the number of samples are not large enough. Despite of these limitations, this study is an effort to report the long-term outcome of Bilateral total knee arthroplasty in the Pakistani cohort. Further multi-center prospective studies are recommended that not only reported the long-term outcome in larger population but certain other important outcome variables such as health related quality of life and physical activity assessments. In addition to this, long term survival of patients who underwent bilateral total knee arthroplasty should also be reported.

CONCLUSION

The long-term outcome of patients underwent bilateral total knee arthroplasty was found satisfactory. It's possible that total knee arthroplasty is widely regarded as the best option for treating end-stage knee osteoarthritis, and that the system can significantly reduce pain, restore physical function, and increase patients' personal happiness.

ETHICAL APPROVAL: The study protocol was approved by the Research Committee Liaquat National Hospital & Medical College, Karachi.

AUTHORS' CONTRIBUTION: HR: Conception and design; acquistion, analysis and interpretation of data;

drafting the article; revising it critically for important intellectual content the article. NK, SN: Acquistion, analysis and interpretation of data. KRN, NA, SR & KK. Acquistion, analysis and interpretation of data; drafting the article; revising it critically for important intellectual content.

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