

Original Article

Total Knee Replacement in Nigeria: An Assessment of Early Functional Outcome of 68 Consecutive Knees

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ABSTRACT

Background: Although there are many methods of treatment for knee osteoarthritis (OA), total knee replacement (TKR) is a very effective way of managing this condition as it improves function and alleviates pain with a consequential improvement on quality of life of patients. To our knowledge, no comprehensive study of the outcome of TKR has been published in our environment, hence the need for a study of our TKR outcomes. **Objectives:** The aim of this study is to describe the pattern of presentations of our patients with knee OA who have undergone TKR, assess the outcome, and identify any variables that affect the outcome. **Patients and Method:** Between November 2008 and November 2013, 68 TKRs for treatment of end stage arthritis were carried out for 52 patients. All the patients were implanted with the same prosthesis design (DePuy and Biomet) and had posterior cruciate substituting knee. The average follow-up was 5 years. The preoperative and postoperative Oxford knee score (OKS) was used for outcome measurement at 1 and 5 years. **Results:** There were 20 males and 32 females (M:F ratio = 5:8). The mean age of the patients was 63.54 ± 0.62 with a range of 55 to 77. There were 18 (26.47%) valgus knees with a mean angle $22.07^\circ \pm 5.73^\circ$, 12 (17.65%) varus knees with a mean angle $14.69^\circ \pm 2.84^\circ$, 8 (11.77%) knees with flexion deformity with a mean angle of $10.2^\circ \pm 1.32^\circ$, and 30 (44.11%) knees had no deformities at all. The variables like deformities, comorbidities, gender, side-affect, and occupation did not affect the outcome ($P > 0.05$). At 1 year and 5 years, there was no radiological evidence of osteolysis, loosening, or component subsidence. **Conclusion:** Despite the deformities and comorbidities, our patients presented with quality of life improved based on the improved OKS of the patient. We recommend a well-planned meticulously executed TKR for patients with debilitating OA in our environment.

KEYWORDS: Comorbidity, deformities, functional outcome, total knee replacement

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INTRODUCTION

Osteoarthritis (OA) is a chronic degenerative joint disease and a leading cause of disability.^[1] The prevalence of symptomatic knee OA in Nigeria is 20.6% for those older than 40 years.^[2] Pain and loss of functional range of movement can be quite debilitating in later stages of the disease.^[3,4] There are many factors that predispose patients to knee OA.^[4-18] Although there are many methods of treatment for knee OA,^[19] total knee replacement (TKR) is a very effective way of

managing this condition as it improves function and alleviates pain^[20-24] with a consequential improvement on quality of life of patients.^[25] Many published data regarding mode of presentation of knee OA requiring TKR and outcome of those who had undergone this procedure are from developed countries.^[26-33] This is

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understandable as joint replacement surgery in Nigeria is still developing.^[34] There is no documented evidence on any publication of outcome of TKR in Nigeria. Therefore, the aim of this study is to describe the pattern of presentations of our patients with knee OA who have undergone TKR, assess the outcome, and identify any variables that affect the outcome.

PATIENTS AND METHOD

Between November 2008 and November 2013, 68 TKRs for treatment of end stage arthritis were carried out by the authors at Davidson & Judith Consultants Clinics Enugu, Nigeria, on 52 patients. All the patients were implanted with the same prosthesis design (DePuy and Biomet) and had posterior cruciate substituting (PCS) knee.

Preoperative assessments were carried out on the patients which included clinical, radiological, and laboratory assessments to determine the degree of knee constraint to be used as well as to rule out infection. Only patients with an erythrocyte sedimentation rate (ESR) <20 mg/dL and C-reactive protein (CRP) <10 mg/dL were operated. All patients had their clotting profile determined and all non-steroidal anti-inflammatory drug (NSAID) anticoagulants stopped 2 weeks before the surgery. All the patients had weight bearing pre-operative X-rays of the affected knees showing anterior-posterior, lateral, and skyline views [Figure 1]. All patients were reviewed by a preoperative assessment team comprising of an endocrinologist, a cardiologist, and an anesthetist who attended to the patients, and those with comorbidities had their medical problems sorted out and certified fit for surgery.

The preoperative Oxford knee scores (OKS) were assessed and the average preoperative OKS was 12 ± 0.5 . The average preoperative packed cell volume (PCV) was 38.24. The average blood transfusion rate was 2 units with a range of 0 to 2 units. The surgeries were carried out under general and regional anesthesia (based on the indication) with an application of an above knee pneumatic tourniquet. We used the anterior approach with a medial parapatellar arthrotomy with a lateral eversion of the patella irrespective of the patients deformities. We routinely put a pin at the patella (which we nicknamed "Registrar's pin") to avoid avulsion of the patella in very tight knees. The osteophytes were removed as they were identified. All thickened synovium were excised. After a proper exposure of the articulating surfaces of the femur and tibia, the articulating surface of the proximal tibia condyles were excised setting the outrigger of the tibial stylus at 8 mm for the less involved condyles and 0 to 2 mm for the involved condyles using a 3° slope cutting

block. The residual defects were built up with cement when it was less than 5 mm and with bone graft and screws when it was more than that. The distal femoral condyles were cut after setting the femoral locating device at 9 mm and 5 to 7 degrees valgus for the varus and non-deformed knees and 3 degrees for the valgus knees [Figure 2]. The varus deformity was managed by excision of medial osteophytes and sequential release of sleeve of soft tissue which is made up of periosteum, insertion of pes anserinus, and deep and superficial layer of the medial collateral ligament. We managed the valgus deformity by release of the lateral capsule, lateral retinaculum, lateral femoral periosteum, distal iliotibial band, and the popliteus tendon when indicated. We managed the flexion deformity by ensuring adequate removal of posterior osteophytes and release of the posterior capsule from the tibia and femur. If at the end of these releases, there was a huge residual flexion deformity with the knee being tight in flexion, we further resected the proximal tibia using the 5° block. The soft tissue was balanced to achieve a rectangular space in extension which was assessed using 8 to 9 mm spacer blocks.

Overall alignment of the lower limb was checked at this point. The distal femur was sized using the femoral sizer and the sized cutting block was placed after confirming the rotational alignment using the parallelism of the transepicondylar line and the posterior condylar axis.

The posterior condyles were cut and the flexion gap was assessed using the same spacer block used in assessment of extension gap. The equality of the extension and flexion gaps was then confirmed. The other chamfer cuts were then completed. The appropriate size notch cutting block was selected to cut the femoral notch [Figure 3]. The appropriate trial tibial tray sizes were selected with an attachment of trial extension rod when indicated. The tibial plateau was then drilled in preparation to take the stem of the plate. The trial tibial insert of the appropriate tray size was inserted on the tibial plate. The appropriate size femoral trial components were now placed on the prepared distal femoral condyle. Thereafter, trial reductions were done checking the soft tissue balance by applying the valgus and varus stress test. Patella tracking is then ascertained. When satisfied with the knee biomechanics, the trial components were then removed and the real components were implanted and fixed using a surface cementation technique with bone cement applied to the undersurface of the tibial base plates [Figure 4]. Wounds were then irrigated with normal saline using pulse lavage. The wounds [Figure 5] were then closed layer by layer using size 2 polyglactin (vicryl) sutures after insertion of active drains.

Immediate post-operative protocol for management included regular pethidine for a period of 48 hours. Intravenous antibiotics was given for 5 days, Subcutaneous Enoxaparin Sodium of 40 mg was given for a period of 2 weeks and the patient on discharge was placed on oral Dabigatran of 150 mg twice a day for a period of 6 weeks.

Patients had our normal protocol for rehabilitation, sitting out, walking with Zimmer frame, walking with crutches, and discharge in 2 weeks after removal of staples/sutures. Patients had initial post-operative radiographs within 24 hours and subsequent ones were taken at the time of assessment of the functional outcome. The post-operative OKS and X-rays were done at 6 weeks, 3 months, 6 months, 12 months, 24 months, 36 months, 48 months, and 5 years.

We used the new OKS^[35] and scored each question from 0 to 4 with 4 being the best outcome. This new scoring system ranges from 0 to 48 with 48 representing the most favorable outcome.

Statistical analysis

We used the statistical package google sheets to analyze the data. Descriptive statistics were calculated for all variables of interest. Continuous measures were summarized as means, standard deviations, and medians. The *P* values for comparing means of continuous variables were determined after selecting a level of significance ($\alpha = 0.05$). We used a paired-sample *t* test to compare the means of our OKS for identified variables.

RESULTS

There were 52 patients and 68 knees. There were 20 males and 32 females (M:F = 5:8). The mean age

was 63.54 ± 0.62 with a range of 55 to 77 [Table 1]. The occupation of patients showed that 12 (23.08%)

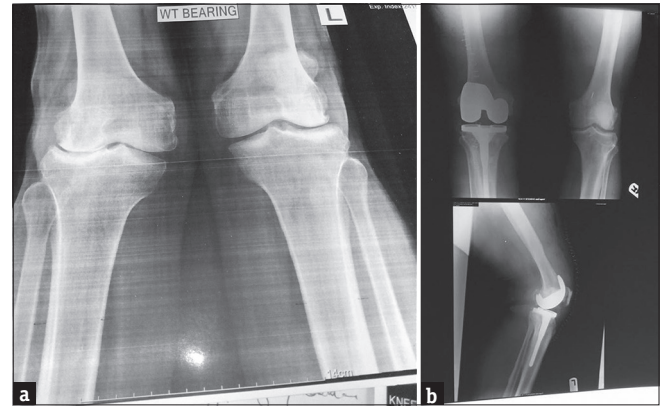


Figure 1: (a) Preop Xray of a patient who had undergone a TKR. Note the extensive sclerosis which had compromised the primary zone of fixation hence the use of extension rod in this case. (b) Post op XRay of a patient who had undergone a TKR. Note the use of extension rod to overcome the compromised primary zone of fixation

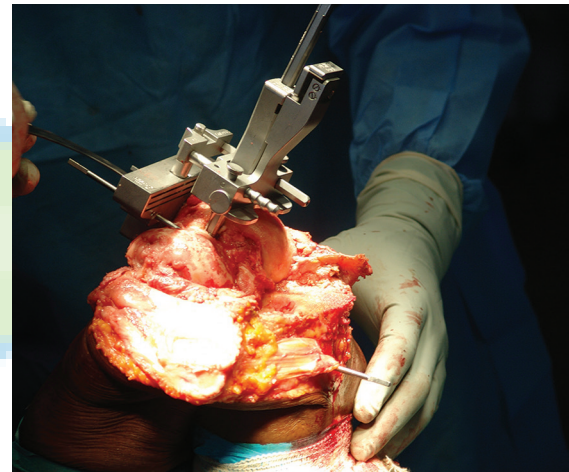


Figure 2: Resection of the distal condyle with the aid of a femoral locating device after the resection of the tibial condyle. Note the depression on the lateral tibia plateau which was filled with bone graft in this case. Note the hypoplasia of the lateral condyle in this valgus knee. Note the “registrar’s pin” fixed at the patella tendon to avoid avulsion

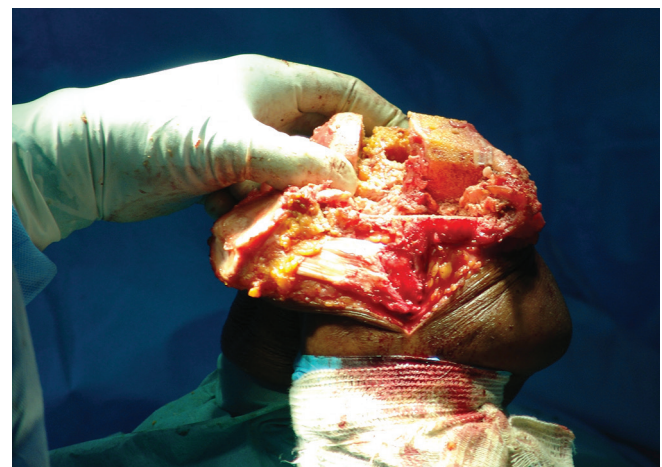


Figure 3: The completed notch box cut.

Table 1: General information

Characteristics	Value
No of patients	52
No of knees	68
Bilateral	16 (30.77%)
Right	12 (23.08%)
Left	24 (46.15%)
Males	20
Females	32
Male:Female ratio	5:8
Mean age of the patients (years)	63.54±0.62
Age range (years)	55-77
Comorbidities	40 (76.92%)
Minimum follow-up period	1 year
The mean pre-op Oxford knee score (OKS)	12±0.5
Mean post-op OKS (1 year)	45.5±1.5 (<i>P</i> <0.001)
Mean post-op OKS (5 year)	47.5±0.5 (<i>P</i> <0.001)
Regional anesthesia	50 (96.15%)
General anesthesia	2 (3.85%)

were retired civil servants, 12 (23.08%) civil servants, 16 (30.77%) traders, 8 (15.38%) business men, and 4 (7.69%) nurses [Table 2]. There were 18 (26.47%) valgus knees with a mean angle $22.07^\circ \pm 5.73^\circ$, 12 (17.65%) varus knees with a mean angle $14.69^\circ \pm 2.84^\circ$, 8 (11.77%) knees with flexion deformity with a mean angle of $10.2^\circ \pm 1.32^\circ$, 30 (44.11%) knees had no deformities at all [Table 3]. Side affected showed that 12 (23.08%) patients had the right knees replaced, 24 (46.15%) patients replaced the left knees, and 16 (30.77%) patients replaced both knees [Table 4]. Forty (76.92%) patients had

comorbidities. The distribution of the comorbidities was as follows: 24 (60%) hypertension only, 4 (10%) hypertension and hip OA, 8 (20%) diabetes mellitus and cardiomyopathy, and 4 (10%) hypertension and diabetes mellitus [Table 5]. Four (7.69%) patients had complications as follows: 1 (1.92%) superficial wound infection, 1 (1.92%) foot drop, 1 (1.92%) collapsed medial plateau with recurrent varus deformity, and 1 (1.92%) death from stroke [Table 6]. A comparison of Mean \pm SD of OKS for identified variables showed the following *P* value: deformities versus non-deformities = 0.429, comorbidities versus non-comorbidities = 0.771, male versus female = 0.75,



Figure 4: Completion of implantation

Table 2: Occupation of patients (n=52)

Occupation	No	%
Retired civil servant	12	23.08
Civil servant	12	23.08
Trader	16	30.77
Business man	8	15.38
Nurse	4	7.69
Total	52	100

Table 3: Analysis of comorbidities, n=40 (76.92%)

Comorbidities	No of patients	%
Hypertension only	24	60
Hypertension and hip osteoarthritis	4	10
Diabetes mellitus and cardiomyopathy	8	20
Hypertension and diabetes mellitus	4	10
Total	40	100

Table 4: side affected (n=52)

Sides affected	No	%
Right	12	23.08
Left	24	46.15
Bilateral	16	30.77
Total	52	100

Table 5: Analysis of the deformities, n=38 (55.89%)

Deformity types	Mean angle	No	%
Valgus deformity	22.07 \pm 5.73	18	26.47
Varus deformity	14.69 \pm 2.84	12	17.65
Flexion deformity	10.2 \pm 1.32	8	11.77
Total		38	55.89

Table 6: Complications: n=4 (7.69%)

Complications	No	%
Superficial wound infection	1	1.92
Foot drop	1	1.92
Collapsed medial plateau with recurrent varus deformity	1	1.92
Death from stroke	1	1.92
Total	4	7.69

Table 7: Comparison of Mean \pm SD of Oxford Knee Score (OKS) for identified variables

Level of significance=0.05, Mean for OKS for patients at 5 years=47.5 \pm 0.5				
Variable: Deformities (n=52)				
Category	No	%	Mean \pm SD	<i>P</i>
Deformities	38	55.89	47.06 \pm 0.23	0.429
Non Deformities	14	44.11	47.02 \pm 0.11	
Variable: Comorbidities (n=52)				
Category	No	%	Mean \pm SD	<i>P</i>
Comorbidities	40	76.92	47.09 \pm 0.26	0.771
Non-comorbidities	12	23.08	47.25 \pm 0.30	
Variable: Gender (n=52)				
Category	No	%	Mean \pm SD	<i>P</i>
Male	20	38.46	47.32 \pm 1.34	0.75
Female	32	61.54	47.30 \pm 1.28	
Variable: Affected side (n=68)				
Category	No	%	Mean \pm SD	<i>P</i>
Right	28	41.18	47.60 \pm 1.28	1.00
Left	40	58.82	47.59 \pm 1.28	
Variables: Occupation (n=52)				
Category	No	%	Mean \pm SD	<i>P</i>
Civil servants	28	53.85	47.59 \pm 0.12	0.8844
Non civil servants	24	46.15	47.62 \pm 1.08	

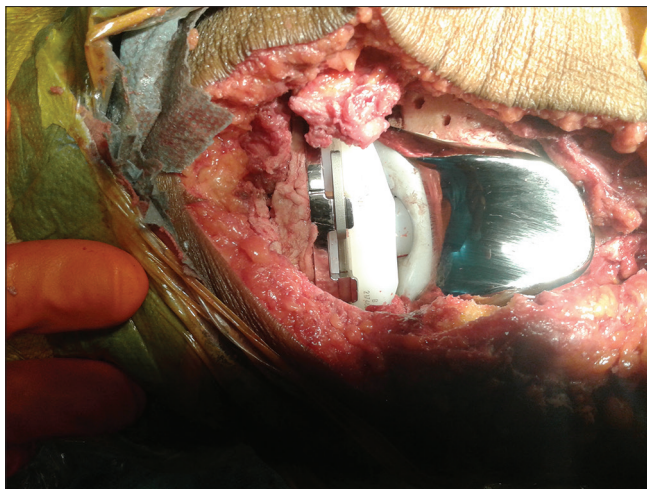


Figure 5: The implanted knee before wound closure

right knee versus left knee = 1.00, and civil servants versus non-civil servants = 0.88; with level of significance at 0.05 ($P > 0.5$) [Table 7].

Radiological assessment

There was no evidence of osteolysis, loosening, or component subsidence at 1 year and 5 years.

DISCUSSION

The treatment of disabling knee joint diseases with joint replacement (arthroplasty) has been recognized since the beginning of the nineteenth century.^[36] Verneviul^[37] suggested the use of soft tissue interposing for reconstructing the knee joint in 1860. At the beginning of the twentieth century, there was a great evolution in total knee arthroplasty (TKA), following the development of inorganic materials suitable for joint interposition and improvement of the surgical technique which were driven by the great efforts of Campbell^[38] and McKeever.^[39]

Since then, TKA has been used to treat disabling OA.^[40,41] TKA is a major surgery whose indications and outcome are linked to a lot of variables including demography. The mean age of our patient was 63.54 ± 0.62 which is in keeping with the general rule that patients below age 55 are not offered TKR.^[42] We had a preponderance of females which is in agreement with the findings of some Brazilian researchers^[43] though gender did not affect our infection rate as theirs.

Manusco *et al.*^[44] carried out a postal survey of orthopedic surgeons and found out that comorbidities and technical difficulties were reasons for not doing an operation. This is at variance with our study in which 76.92% of our patients had comorbidities with hypertension as the most common ailment. There was no statistically significant difference between the

OKS of the patients with comorbidity and patients without ($P > 0.05$). This is at variance with the findings of Elmallah *et al.*^[45] who concluded in their study that hypertension, cardiovascular disease, endocrine disease, and gastrointestinal disease may correlate with poorer functional and activity outcomes postoperatively. The reason for this variance may be attributed to our protocol which inevitably produced particular cohort of patients. For instance, every patient of ours was reviewed by a team of medical experts comprised of a cardiologist, an endocrinologist, and the anesthesiologist who certified the patient fit for TKR based on the benefit risks ratio.

Majority (55.89%) of our patients had knee deformities with more patients having valgus (26.47%) deformities than varus deformities (17.65%). This pattern of presentation is at variance with the findings of Hatem *et al.*^[46] who found varus and flexion deformities in their series. Our group of knees with valgus deformity is much higher than generally reported.^[47] These deformities are secondary changes as a result of the degenerative changes of the ongoing OA, hence the longer the condition the more the deformities. Patients in our environment report late,^[48] and this may be the reason for the existence of these deformities.

The OKS between those with deformities and those who did not have was not statistically significant ($P > 0.05$). We had always believed that TKR is about soft tissue release and the surgeon happens to cut bone while doing so. Consequently, in our procedures, we were meticulous and pains taking about soft tissue release. We adopted a sequence of immediate assessment of the extension gap and lower limb alignment after resection of the distal femoral condyle and proximal tibial condyle. When satisfied, we proceeded to cut the posterior condyle with immediate assessment of the flexion gap lower limb alignment. It was only when we were satisfied with the soft tissue tension and balance that we proceeded with the femoral chamfer cuts. We firmly believe that time spent in achieving soft tissue balancing is worth the exercise. The other identifiable variables like gender, occupation, and laterality did not in any way affect the mean OKS. We had an overall complication rate of 7.69% which is within the 1.65% to 11.3% range in most studies^[49,50] which is in contrast with 20% rate in the series reported by Fayeque.^[51]

We had one case of superficial wound infection which we resolved with dressings and parental antibiotics. The one case of foot drop was due to neurapraxia of the common peroneal nerve in a valgus knee and the patient recovered with intensive physiotherapy. We had a case of collapse of the medial plateau of the tibia and the knee was revised with an extension rod. This

was in a patient who had an extensive sclerosis on tibia, the medial condyle. Consequently, we developed a protocol of putting an extension rod in any knee that had extensive sclerosis on the medial plateau or had the medial defect filled with a graft and held with screw. We had a mortality 1 week post operation in a 78-year-old female with a clinical diagnosis of stroke made before she died.

CONCLUSION

We have audited our patients who had PCS TKR following disabling OA of the knee. The intervention was very cost effective. The deformities and comorbidities our patients presented with did not affect the outcome. Our patients' quality of life improved based on the improved OKS of the patient. We recommend a well-planned meticulously executed TKR for patients with disabling OA in our environment.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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