Mid-Term Outcome of Total Knee Replacement with All-Poly Ethylene Tibial Components.

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ABSTRACT

Objective: To determine the mid-term functional and radiographic outcome of primary total knee replacement with all-polyethylene tibial components.

Methods: This descriptive study was conducted in Orthopaedic Department of Ghurki trust Teaching Hospital Lahore from 25th June 2014 to 29th June 2019.All patients fulfilling the inclusion criteria who were operated with all-polyethylene tibial component were included in our study. Post-operative functional outcome was assessed at three years with Knee Society Score and graded as excellent, good, fair and poor for Knee score and Function. Radiological outcome was assessed by measuring tibial angle, tibial-femoral angle and femoral flexion angle on anterio posterior and lateral radiographs.

Results: During this study 65 knees of 34 patients were replaced by using all-polyethylene tibial component implant. Male patients were 15(44.1%) and females 19 (55.8%). Mean age of our patients were 60.4±6.12 years (range 50-80 years). Bilateral total knee replacement (TKR) was done in 31(91.1%) patients while 3(8.8%) had unilateral knee Arthroplasty. At three years follow up the knee score was excellent in 3(8.8%), good in 15(44.1%), fair in 12(35.2%) and poor in 4(11.7%) patients. The function score was good in 11(32.3%) fair in 14(41.1%) and poor in 9(26.4%). Anterio posterior radiograph revealed mean tibial angle 89±1.72°(range 84-92°), tibia-femoral angle 5.0±0.53°(range 4-6°) and femoral flexion angle 96±1.88°(range 94° to 102°).Lateral radiograph showed mean tibial angle 89.9±1.24°(range 85 to 92°) and mean femoral flexion angle 10.83±1.49°(range 10-16°).

Conclusion: Total knee replacement with all- polyethylene tibial components had excellent and good functional and radiological mid-term outcome in majority of our patients.

Key Words: Knee Society Score, Osteoarthritis, Poly-Ethylene Tibial Component, Total Knee Replacement.

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INTRODUCTION

Early condylar total knee replacement designs with all polyethylene tibial component showed excellent results in osteoarthritis knee with longevity and survivorship in 70-90% patients at 15 to 20 years.[1] However, literature revealed that a common factor for replacement failure was aseptic loosening caused by the design of tibial component, so selection of implant is getting importance.[2,3] Opponents of all-polyethylene tibial components are of the opinion that compression forces within the cement and bone are reduced by metal backed tibial component and component distributes load more evenly especially during asymmetrical loading.[4,5] Metal back tibial component is not only more modular but also reduces the bending stresses within the stem.[4-8] Critics of metal back components argue that these

implants are costly and eccentric loading enhances tensile forces at the interface leading to accelerated back side wear.[9,10] Although all- polyethylene tibial components preserves tibial bone, avoids backside wear and are relatively cheap, it accounts for only 14% of total registered knee arthroplasties.[11] Several studies have compared the outcome of all-polyethylene tibial components designs with metal back component in terms of survival, revision and complications and the results are comparable.[12-14] Many authors prefer all-polyethylene tibial components for low income patients with lesser physical activities.[15-18]

In our hospital the choice of primary TKR implants depends largely upon surgeon choice and expertise. But we have started using all polyethylene tibial component because it is a comparatively low cost implant thus economically feasible to a large section of our population which are low income. The results of our study would help us in formulating standard guidelines for patients of knee osteoarthris requiring total knee replacement. The objective of our study was to determine the mid-term functional and radiographic outcome of primary total knee replacement with all poly ethylene tibial components.

METHODS

We conducted this descriptive study in Orthopaedic Department Ghurki trust Teaching Hospital Lahore from 25th June 2014 to 29th June 2019.All patients of either gender and age suffering from advanced primary osteoarthritis and rheumatoid arthritis of the knee joints were included in our study. Patients with traumatic deformities, healed fractures with peri articular implants and revision TKR were excluded from study. The study was approved by the Ethical Committee of our hospital. Informed written consent was taken from all patients. In the included subject's full history, clinical examination and radiographs were taken.

Under general or spinal anaesthesia the patients were operated with all-polyethylene tbial component TKR(® Zimmer All-Poly).Bilateral TKR was performed simultaneously in one session. All surgeries were performed under tourniquet control. Pre-operative intravenous antibiotics (injection Cefuroxime 1.5 gm) was administered to all patients. The knee was exposed through longitudinal mid line incision and medial parapatellar approach. The surgical technique of Williams and Garbuz was adopted in all cases.[19]

Post operatively optimal physiotherapy protocol was executed by physiotherapist consisting of exercises of quadriceps, hamstring, gluteal, range of motion and ambulation with a walker. Antibiotics were continued for 24 hours after surgery. Drains were removed when dry usually 24-48 hours after surgery. Low molecular weight heparin (Enoxaprin-Clexane®) was continued for thromboembolic prophylaxis for one week post operatively. Patients were discharged home when they were pain free and mobilized with a walker or crutches usually at 5 to 7th days post operatively. Follow up protocol consisted of visit at 2nd week,4th week,6th week and 8th week initially, then monthly for 6 months followed by every three months till three years.

Post-operative functional outcome was assessed at three years with Knee Society Score[20] and graded as Excellent(80 to 100 score),good(70 to 79),fair(60 to 69) and poor(<60).Radiological outcome was assessed by measuring tibial angle, tibial-femoral angle and femoral flexion angle on anterio posterior and lateral radiographs.

We analyzed our data with SPSS version 22. Frequency and percentages were calculated for quantitative variables while mean and standard deviation for qualitative variables. Data presented in table where necessary. Functional outcome was compared among gender and different age groups and *P* value was calculated with Chi-Square test and value < 0.05 was considered as statistically significant.

RESULTS

The total number of patients in our study were 34 and TKR was performed on 65 knees with bilateral TKR in 31(91.1%) and unilateral in 3(8.8%) patients. The mean age of our patients were 60.4±6.12 years (range 50-80 years). The age distribution of our patients are shown in table I. Majority (91.1%, n=31) of our patients had primary osteoarthritis while 3(8.8%) patients had rheumatoid arthritis. At three years follow up the knee score was excellent in 3(8.8%), good in 15(44.1%), fair in 12(35.2%) and poor in 4(11.7%) patients. The function score was good in 11(32.3%) fair in 14(41.1%) and poor in 9(26.4%). Patients in the age range 50 to 60 years had better functional and radiological outcome but statistically not significant($P \geq 0.05$).Patients of osteoarthritis had better functional score than rheumatoid arthritis.($P<0.05$). The mean preoperative range of motion was 80° (range 70° to 100°).The postoperative range of motion was 106±1.9 (range 85°-100°). Improvement in flexion contracture was seen from preoperative 4.5±6.06° to 2.0±0.45° after Arthroplasty.

Anterio posterior radiograph revealed mean tibial angle 89±1.72°(range 84-92°), tibia-femoral angle 5.0±0.53°(range 4-6°) and femoral flexion angle 96±1.88°(range 94° to 102°).Lateral radiograph showed mean tibial angle 89.9±1.24°(range 85 to 92°) and mean femoral flexion angle 10.83±1.49°(range 10-16°).Accurate alignment of the poly ethylene component was found in 59(90.7%) Arthroplasty while 6(9.2%) Arthroplasty were not properly aligned. There was one (2.9%) case of delayed wound healing due to infection. We did not find any case of deep vein thrombosis or pulmonary embolism. Patellar subluxation was noted in 1(2.9%) patient and retro patellar pain in 3(8.8%) patients. Two knees (3%) were revised. There was 1(2.9%) case of periprosthetic fracture which was treated with locking plate. No loosening of prosthesis was seen.

Table I: Age distribution of patients (n=34)

Age (years)	Number of patients	Percentage
50-60	11	32.0
61-70	18	53.0
71-80	5	15.0

Table II: Survivorship (Revision rate) of primary all-polyethylene TKR in literature

S. No	Author's Name	Year	Patient Age(Years)	Kaplan-Meier Survivorship (95% CI) for Revision
1	Scuderi GR[24]	1989	67(20-87)	90.6%@ 15 years
2	Faris PM[6]	2003	70.3(34-91)	68.1%@ 10 years
3	Ranawat AS[25]	2005	57(47-60)	1.8%failure rate @ 5 years
4	Shen B[26]	2008	62(56-68)	93.5@ 5 years
5	Dalury DF[27]	2009	76(≥70)	99.4%@ 7 years
6	Gioe TJ[28]	2009	69(≥ 60)	91.6%@ 10 years
7	Bettinson KA[29]	2009	69.3(50-93)	94.5%@ 10 years
8	Houdek MT[30]	2016	≥ 85	99%@ 5 years

DISCUSSION

In our study 34 patients of TKR with all-polyethylene component resulted in excellent knee score in 3(8.8%), good in 15(44.1%), fair in 12(35.2%) and poor in 4(11.7%) patients at three years follow up. The function score was good in 11(32.3%) fair in 14(41.1%) and poor in 9(26.4%) patients. The mean preoperative range of motion improved from 80° (range 70° to 100°) to postoperative 106±1.9(range 85°-100°).Gustke[10] and colleagues evaluated two years post-operative results of 227 knees treated with all- polyethylene tibial components. The mean age of their patients were 80.8 years. Their patients had an average knee society score of 94.2 and functional score of 57.2.The ROM was 115.4 degrees. They reported no revision at two years. In a randomized study, Gioe TJ[21] compared 111 polyethylene TKR and 102 metal backed TKR with a minimum follow up of three years. The pre-operative Knee Society score improved from 38 to 84 in the poly ethylene group and from 35 to 85 in the metal back group. The functional score improved from 56 to 74 in all-poly ethylene group and from 57 to 72 in metal backed group. Range of motion was 106 degrees in poly ethylene group and 107 in metal back group. The tibio femoral alignment in both the groups were 6 degree valgus. The authors concluded that all-polyethylene TKR is less expensive implant and an excellent alternative to metal backed TKR.

In a systematic review Nouta[22] and his colleagues reviewed 26 articles narrating 12500 TKR and 231 revision TKR. They documented that although all-poly ethylene tibial component TKR had better radiographic fixation but clinical scores and revision rates were equivalent to that of metal based components. Najibi and Iorio[23] compared 49 all-poly ethylene tibial TKR with 49 metal-backed TKR and found similar outcome as measured with SF-36 scale and patient outcome scale. However, they reported that metal backed tibial implants were costly and osteolysis and polyethylene wear was common.

In our study two knees (3%) were revised because of mal alignment of implant. These cases were our earlier surgeries and no such complications were reported in our later cases.In literature variable survivorship of all-poly ethylene TKR has been reported (table II). In our study we could not

evaluate the outcome of all-polyethylene TKR in obese patients. Alhifzi[31] treated 158 patients with primary TKR using all polyethylene component. He observed that although all-poly ethylene tibial component of TKR had lower cost, safe, effective and good outcome but obese patients with Body Mass index(BMI) greater than 37.6 were more likely to need revision(P= 0.04).

Besides small sample size and descriptive design as potential limitations of our study, the follow up should have been long to confirm our results. Moreover we were not able to compare outcome score in normal versus obese patients.

CONCLUSION

Total knee replacement with all- polyethylene tibial components had excellent and good functional and radiological mid-term outcome in majority of our patients. We recommend all-polyethylene tibial TKR as an implant of choice for elderly low demand patients with low socioeconomic status.

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