



Orthopaedics

A STUDY OF PRIMARY TOTAL KNEE ARTHROPLASTY (TOTAL KNEE REPLACEMENT) IN SEVERE DEGENERATIVE OSTEO ARTHRITIS OF KNEE

Dr. Voligi Shekhar*	M.S, Associate Professor of Orthopaedics, Osmania Medical College / Osmania General Hospital, Hyderabad. Telangana. *Corresponding Author
Dr. Sateesh Chandra P	M.S, Assistant Professor of Orthopaedics, Osmania Medical College / Osmania General Hospital, Hyderabad. Telangana.
Dr. Gunda Veera Reddy	M.S., Associate Professor of Orthopaedics, Osmania Medical College / Osmania General Hospital, Hyderabad. Telangana.

ABSTRACT **AIM:** To assess the clinical outcome, to study radiological variable influencing the outcome of total knee arthroplasty and to identify patient variable which significantly influence the outcome. **MATERIALS&METHODS:** Out of the 30 Arthroplasties performed in 28 patients with in the study period. 5 patients (5 knees) were lost to follow-up for various reasons and thus 23 patients (25 knees) were available for clinical review. **RESULTS:** The mean age of the patient at the time of surgery was 61.04 years. 76% of Knee had primary osteoarthritis and 25% had secondary OA. The average post-operative alignment as 4.3° valgus (range, 3° varus-10° valgus), the mean posterior slope of tibia (s) was 3.5° (range, 0-8°)c and the average femoral flexion angle (?) 7.6°. **CONCLUSION:** In the assessment of post operative outcome of total knee arthroplasty, Knee Society Score is a very useful tool. Restoration of normal alignment of valgus (6 + 2°) is possible with conventional (without computer assisted navigation) surgical technique.

KEYWORDS : Total Knee Arthroplasty (TKA), Osteo arthritis (OA), Total Knee Replacement (TKR), Rheumatoid Arthritis (RA).

INTRODUCTION

Total Knee arthroplasty has brought to the field of orthopaedic surgery a successful and predictable procedure for the management of the painful and degenerative knee. Though there are procedures such as osteotomy, unicompartmental replacement, which could serve purpose in carefully selected patient populations, TKR remains by far the procedure of choice for many degenerative knees because of high reproducibility of predictable good to excellent results¹.

Total knee replacement in some form has been around for over 50 years. The complexities of the knee joint only began to be understood 30 years ago and because of this total knee replacement was initially not as successful as Sir John Charley's artificial hip. However the last twenty years there have been dramatic advancements in knowledge of knee mechanics that have led to modifications of design which appear to be durable. As with most techniques in modern medicine the envelop is constantly expanding so that more and more patients are receiving the benefits of total knee arthroplasty².

However, the success of total knee arthroplasty has not come without cost. Many early design were accompanied by poor clinical results or early prosthetic failure and instability. Fully constrained knee arthroplasties and hinged prostheses, which were designed to enhance joint stability, were also fraught with unacceptably high long-term failure rates.

Surfaces replacements ushered the era of modern prostheses and provided an impetus to the continuous efforts in the development of view design, fixation techniques and refinements of surgical procedure. Now there are several prosthetic design available that have withstood the test of time and our understanding of latest concepts in surgical technique allow us to be optimistic about the longevity, durability and functional results of total knee arthroplasty³.

AIM OF THE STUDY

1. To assess the clinical outcome of the procedure.
2. To study radiological variable influencing the outcome of total knee arthroplasty
3. To identify patient variable which significantly influence the outcome.

MATERIAL & METHODS

A consecutive series of 30 primary total knee arthroplasties were performed on 28 patients using PFC Sigma endoprosthesis. Out of these cases five patients (5TKAs) were lost to follow up due to various reasons and thus 23 patients (25 TKs) were available for clinical review. The patients were assessed clinically and radiologically using the Knee society rating system.

Inclusion Criteria

1. Primary Total Knee arthroplasty using PFC Sigma endoprosthesis
2. Patients with failed conservative treatment in sever degenerative arthritis

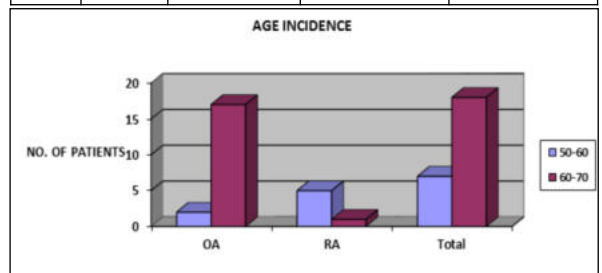
Exclusion Criteria

1. Recent or current active sepsis
2. Remote source of ongoing infection
3. Stable, painless arthrodesis in functional position prospects of a successful arthroplasty are not good, a constrained prosthesis is usually required; in the event of failure, rearthrodesis may not succeed
4. Genu Recurvatum associated with muscular weakness or paralysis is likely to recur following TKR and places stress on the prosthesis which increase likelihood of loosening
5. Quadriceps weakness (Extensor mechanism dysfunction) arthrodesis is considered better choice.

RESULTS

Age

S. No	Age	OA	RA	Total
1	50-60	2	5	7
2	60-70	17	1	18



Diagnosis

The indication for surgery was osteoarthritis in 17 patients (19 knees (76%) of total) and rheumatoid arthritis in 6 patients (6 knees, (24%) of total).

DETAILS OF THE PATIENTS WHO RECEIVED TKA'S

S. No	Characteristics	
1	Total number of TKAs	25
2	Number of patients	23
3	Gender	
	Male	07
	Female	16

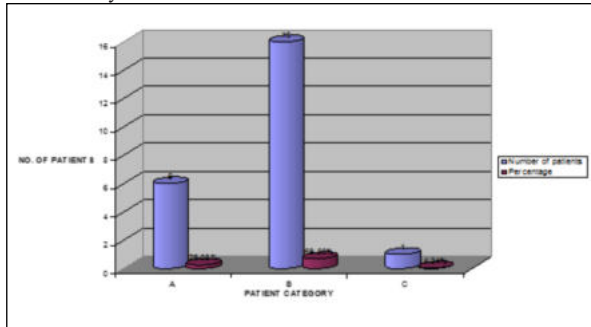
4	Side Distribution Right Left	13 12
5	Mean age of men in years (range)	60.8 (50-68)
6	Mean age of women in years (range)	61.11(50-70)
7	Mean time of follow up in months (range)	15.7 (28-3m)

Sizes Of The Components Used

Femoral Components size	Total No.	%
4	2	8
3	9	36
2.5	8	32
2	4	16
1.5	2	8
Tibial component size		
4	2	8
3	8	32
2.5	9	36
2	6	24
Size of femoral & tibial components		
Equal size	9	36
Femoral >Tibial	10	40
Femoral < Tibial	6	24
Tibial insert thickness		
8 mm	10	40
10 mm	14	56
12.5 mm	1	4
15 mm	-	-

Clinical Results

Patients were stratified into 3 categories according to Halley and Charnley: 7 in category A (unilateral or bilateral TKA), 17 in category B (one knee symptomatic but not replaced), and 1 in category C (multiple arthritis or medical infirmity). At follow-up, patients were evaluated clinically by an independent observer using the American Knee Society Score.



Knee Score

	Pre-operative KSS	Post operative KSS
Average	28.92	88.72
OA	27.42	89.15
RA	33.6	87.3

Function Score

	Pre-operative Function Score	Post Operative Function Score
Average	22.8	69.4
OA	27.42	68.42
RA	13.3	72.5

Range Of Motion

The average preoperative range of motion was 77° (87° in OA and 45° in RA). In RA, the knees were stiffer. The mean post operative active flexion was 94°. The post operative flexion in patient with OA (96°) was greater than that in patients with RA (84°).

Post Op Instabilities And Deformities

No knee had more than 10 mm anteroposterior instability and no patient had a flexion deformity > 10°.

Pain Relief And Walking Abilities

At the most recent follow-up, relief of pain was excellent in most patients: 22 out of 23, (95.6%) had no pain or very mild pain. 22 out of 23 patients (95.6%) could walk farther than 10 blocks, and 20 out of 23 patients (86%) did not assistive devices for ambulation.

RADIOGRAPHIC RESULTS

Alignment

The mean femoral component alignment (q) from the anteroposterior view was 96.36° range, 90-100 and the mean tibial component alignment (b) from the (Tibiofemoral angle) was 89.16° (range 83-92). The average post-op anatomical alignment tibiofemoral angle was 4.3 valgus (range 3° to 10° valgus). The mean posterior slope of the tibia 3.5° (range, 0° to 8°) i.e., tibial angle on lateral view was 87.72° (range, 82°-90°). The average femoral flexion angle (?) was 7.6° (range -2° to 11°)

Radiolucencies

No knee had evidence of radiographic loosening which required revision. Among all other radiographs, radio lucent lines of 1 mm thick were present around zones 1 & 2 in 3 tibial components and around zone 1 in 2 femoral components. No radiolucency was progressive, was more than 2 mm or extend beyond 2 zones.

Complication

None of the patients had clinically evident DVT.

Wound healing was delayed in five cases, of which, there was superficial wound infection in one case and in another case the wound needed secondary suturing. Two of the cases with delayed wound healing were rheumatoid knees. All the knees had no local skin or wound problems on follow up.

One knee presented with pain four months post operatively, with deep infection presented with swelling and erythema around the knee post operatively. Aspiration from knee under sterile conditions yielded pus. Debridement and prosthesis retention in the setting of late chronic infection (more than 4 weeks post-op and insidious onset of symptoms) have been universally unsuccessful and should not be attempted. Yonekura et al advocated two stage revision for treatment of infections. The cultures grew MSSA (Methicillin Sensitive Staphylococcus aureus). The patient was treated by prosthesis removal and arthodesis of knee with Charnley clamps, as the patient was not willing for two stage revision with articulating antibiotic spacer and wanted a permanent cure.

DISCUSSION

TKA can provide excellent pain relief and restoration of function for patients with primary or secondary osteoarthritis. The success of the procedure is based on prosthesis survival, in addition to pain relief and restoration of function. This study found good-to-excellent short-term results with cemented cruciate retaining PFC Sigma total knee arthroplasty system.

The mean age of the patient at the time of surgery was 61.04 years (range, 50-70). This is only slightly less than that of other studies Dixon et al⁶, 67 years, Raman et al⁵, 74.2 years (range 59-90 years) Martin et al⁶, 67 years (range 22-91 years).

76% of Knee had primary osteoarthritis and 25% had secondary OA (with RA). The mean age of the patients with OA was 62.8 years and those with RA was 55.16 years. This shows that patients with RA needed knee replacement at an early age.

36% of knee had equal tibial & femoral sizes. In the event of unequal size, the femoral component was larger than the tibial component (40%) as opposed to the use of a smaller femoral component than tibial in only 24% (6 out of 25 knees). The PFC sigma arthroplasty system, we have used, allows upsizing or downsizing of the components. This may not be considered as mismatch and any polyethylene where, if any, needs to be confirmed on long term follow up.

The mean post-operative Knee Society and function scores in the present study were 88.72 and 69.4, respectively, with mean follow up period of 15.7 months (range, 3-28 months), whereas, Martin et al reported 88 and 72, respectively, with mean follow up period of 5-9 years. Claytol et al⁷ reported the medium American Knee Society score of 93/100 at 5 years. Asif et al⁸ reported average post-op knee score of 87 and function score of 72. Alemparte et al⁹, reported 89 and 64 points, and Buchler et al¹⁰, reported 96 and 68 points with mean follow up of 9 years. Dixon et al reported 96 and 78 at minimum 15 years follow up.

Considering the classification of result, Knee score is within the range of excellent (85-100 points), however, Function Score is graded as fair

in our study compared to the 'good' score in other studies. The unfavorable function score may be because of the relatively more number of patients in categories B.

Knee score in our study were better in patients with osteoarthritis than those with rheumatoid arthritis. The post-op Knee Score and Function Score were 89.15 and 68.42 in OA, 87.3 and 72.5 in RA. **Dixon et al.** had scores of 97 and 85 in OA and 94 and 61 in RA. **Martin et al.** reported scores of 87 and 74 in OA and 88 and 65 in RA. **Asif et al.** had scores of 88 and 73 in OA and 79 and 57 in RA.

Dixon et al. stated that the post-operative flexion in a patients with OA (116°) was significantly greater than that in patients with inflammatory arthritis (104°). In our series also, we have made similar observation where the mean post-operative flexion in OA (96°) was greater than that in patients with RA (84°).

In our study no knee had more than 10 mm of antero-posterior instability post-operatively similar to the observation made by **Martin et al.** and **Asif et al.** Post-operatively, no knee had flexion deformity more than 10° similar to the observation made by **Schai et al.**

Martin et al. reported 84% pain free patients at final follow up, 51% of patients could walk farther than 10 blocks at 71 used no assistive devices for ambulation. **Asif et al.** reported that at last follow up 82% had no pain or very mild pain, 59% could walk farther than 10 blocks and 91% did not use assistive devices for ambulation. In our series, we found similar results, i.e. excellent pain relief in 95.6% 95.5% able to walk farther than 10 blocks and 86% used no assistive devices for ambulation.

Raman et al. studied five year results of PFC Sigma TKA and reported average knee valgus angle of 3.5° (range 0.5-7.4°), average flexion angle of 3.9° (1-9.2°) and tibial slope of 3.1° (0-7.1°). **Martin et al.** reported an average post-operative anatomic alignment of 60 valgus (range, 5-9° valgus). In our study, the average post-operative alignment as 4.3° valgus (range, 3° varus-10° valgus), the mean posterior slope of tibia (s) was 3.5° (range, 0-8°)c and the average femoral flexion angle(?) 7.6°.

Press – Fit Condylar Sigma prosthesis (PFC prosthesis as well) was designed for cemented or cementless fixation. **Wright et al.** reported re-operation rate of 3% in their study of hybrid fixation with uncemented femoral component in a 2-4 year period of cruciate sparing condylar TKA. **Rand et al.** did a comparative study of cemented vs cementless fixation at 2.8 years follow-up & reported good or excellent results in 98% of cemented compared with 90% of cementless knees and re-operation in 7% of cemented & 19% of cementless knees. **Duffy et al.** compared cemented & cementless knees at follow-up of 10 years & estimated survivorship at 10 yrs as 88% for cementless and 96% for cemented knees. Our study did not have any cementless fixation.

One knee with deep infection at 4 months post-operatively showed growth of MSSA from the knee aspiration under aseptic conditions. Debridement and prosthesis retention in the setting of late chronic infection (more than 4 weeks post op and insidious onset of symptoms) have been universally unsuccessful and should not be attempted. **Yonekura et al.** found that in two stage revision for the treatment of infections, the highest success rates were noted after the treatment of early post operative and acute hematogenous infections. Moreover, the patient was not willing for two stage revision⁴³ with articulating antibiotic spacer and wanted a “permanent cure”. So, the patient was treated by prosthesis removal and arthrodesis of knee with Charnley camps. Post operatively on follow up, patient was completely free from pain after removal of the fixator.

Martin et al. reported 5.5% post operative surgical complications requiring re-operation.

The definition of failure of a total joint arthroplasty has not been consistent in the literature, but revision of arthroplasty has been the most commonly used criterion. We included all reoperations for any indication, to comment about the survivorship in our study.

In our series, the survival rate of implants without revision or a need for reoperation was 96.07%. However, the sample size of our study (25 knees) and the duration of follow up 15.7 months (3-28 months) are too small to compare with the studies in the literature. Moreover no

survivorship analysis has been done. Important issues related to survivorship analysis include the number and outcome of patients lost of follow-up and the number of subjects followed each year, **Raman et al.** reported overall survival at 5 years of 97.5% with removal or repeat revision of any component for any reason as the end point. **Dixon et al.** reported 92.6% survival at 15 years follow up, while **Buchler et al.** 93.4% (at 10 years follow up) and **Schai et al.** 92% (at 10 years follow-up).

Our results show good-to-excellent clinical outcome comparable with other studies. However, as the results are short term, this study would form a baseline to compare the results of computer assisted navigation which is expected in future years at our institute.

CONCLUSION

1. Total Knee replacement is a very effective procedure in the management of symptomatic degenerative arthritic knee.
2. Excellent improvement in pain scores is possible in most of the patients.
3. In the assessment of post operative outcome of total knee arthroplasty, Knee Society Score is a very useful tool.
4. Restoration of normal alignment of valgus (6 ± 2°) is possible with conventional (without computer assisted navigation) surgical technique.
5. In our series, cemented cruciate retaining total knee arthroplasty has demonstrated good to excellent results.

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