

# Functional Outcome of Rotating Platform Versus Fixed Platform of Total Knee Arthroplasty- A Comparative Study

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## Abstract

**Background:** Total knee arthroplasty (TKA) has shown to be a successful and reliable procedure for older, debilitated patients with knee osteoarthritis. TKA's indications were widened to include younger and more active patients after its initial success.

**Objectives:** To compare the functional outcome of rotating vs fixed platform of total knee arthroplasty

**Methods:** All patients who are fit to undergo total knee arthroplasty like advanced stages of osteoarthritis and rheumatoid arthritis in age group of 50-70 years . We compared the functional outcome between rotating platform versus fixed platform of Total Knee Arthroplasty. Clinical and radiological follow-up was performed at 1, 3, 6 months and 1year after the operation. Pre-operative and follow-up ratings according to Knee Society Scoring system were obtained for all the patients. In addition, a visual analogue scale was used to specially assess the severity of the pain

**Results:** In group A and group B there were 6 males (30%) and 14 females (70 %). In both the groups the mean post operative range of movements were significantly improved for the follow-up at every 3months with the mean ROM of 120° achieved at 1year follow-up. The ROM has significantly improved from 90° at 3<sup>rd</sup> month follow- up to 120° at 1year follow-up. The mean KSS knee and functional score were gradually improved in post operatively in 3<sup>rd</sup>, 6<sup>th</sup> and 1year follow-up compared to the pre operative KSS score.

**Conclusion:** The post-operative range of motion and the Knee Society functional score were similar in both groups. There was no significant statistical difference between the two groups of Total Knee Arthroplasty in terms of post-operative range of motion and functional outcomes.

**Keywords:** Total knee arthroplasty, KSS score, rotating platform, fixed platform

## Introduction

In the last 30 years, total knee arthroplasty (TKA) has shown to be a successful and reliable procedure for older, debilitated patients with knee osteoarthritis.<sup>1</sup>

TKA's indications were widened to include younger and more active patients after its initial success. The emergence of mobile-bearing polyethylene surfaces reflects efforts to reduce wear while coping with complicated function and kinematics.<sup>2</sup>

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The wear of the bearing surface is linked to long-term TKA survival, which has been extensively documented in the orthopaedic literature. TKA wear patterns differ from total hip arthroplasty wear patterns in that delaminating and pitting occur. The shear force causes bigger particles to form. However, significant submicron polyethylene debris is still formed, which can cause osteolysis.<sup>3</sup>

This can cause the implant to loosen and eventually fail. Engineers and orthopaedic surgeons have long sought a “better” knee design with longer survivorship despite strong long-term survival. The mobile-bearing knee was designed to take advantage of the reduced stress found in conforming designs, minimising polyethylene wear while reducing implant stress and lessening the danger of tibial component loosening.<sup>4</sup>

Furthermore, the mobile design was thought to more nearly resemble natural knee kinematics. However, while selecting the most appropriate implant for his or her patient, the orthopaedic surgeon must be wary of the likelihood of a market push as new and “better” implants are introduced. Total knee arthroplasty (TKA) is a popular procedure for treating severe osteoarthritis of the knee joint.<sup>5,6</sup>

The objective, on the other hand, was to see if patients who received a rotating platform implant had a better functional result than those who had fixed bearing implants. The goal of this study is to produce an evidence-based evaluation that compares fixed bearing with mobile-bearing TKA in terms of survival and clinical outcomes.

## Materials and Methods

Patients were included if they were eligible for treatment with a complete knee replacement system with either fixed or movable bearings and had given written informed consent. After receiving approval from the hospital's Ethical Committee, the current study will be carried out at Yenepoya medical college hospital. A well-structured and well-prepared case The clinical history, physical examination findings, and investigation findings will all be included on a proforma.

**Duration of study:** June 2018 to July 2020

## Inclusion criteria:

- All patients who are fit to undergo total knee arthroplasty like advanced stages of

osteoarthritis and rheumatoid arthritis in age group of 50-70 years.

## Exclusion Criteria:

- Patients with rheumatoid arthritis and patients undergoing revision arthroplasty, requiring tibial component augmentation or a femoral component augmentation or a constrained prosthesis were excluded.

We compared the functional outcome between rotating platform versus fixed platform of Total Knee Arthroplasty. Clinical and radiological follow-up was performed at 1, 3, 6 months and 1 year after the operation. Pre-operative and follow-up ratings according to Knee Society Scoring system were obtained for all the patients. In addition, a visual analogue scale was used to specially assess the severity of the pain

**Statistical Analysis:** The SPSS 22 software was used for statistical analysis. The data outcome was presented in the form of tables with means and percentages.

## Observation and Results

**Table 1: Distribution based on Gender and age group**

Gender	Group A	Group B
Male	6(30%)	6(30%)
Female	14(70%)	14(70%)
Total	20	20
Age Group		
Mean $\pm$ S.D	63.75 $\pm$ 6.138 yrs	62.75 $\pm$ 7.860 yrs

In group A and group B there were 6 males (30%) and 14 females (70 %).

In group A, The mean age was 63.75  $\pm$  6.138 years.

In group B, The mean age was 62.75  $\pm$  7.860 years.

Gender	Group A	Group B
B/L	9(45%)	3(15%)
LT	3(15%)	7(35%)
RT	8(40%)	10(50%)

**Table 3: Statistics of group A**

		Post_op_rom_3M	Post_6M	Post_op 1 yr	Knee_score_3M	Knee_score_6M	Post_op_knee_1year	Fun_score_3M	Fun_score_6M	Fun_score_1yr
N Valid		20	20	20	20	20	20	20	20	20
Mean	miss-	0	0	0	0	0	0	0	0	0
Median	ing	95.00	108.50	120.50	64.00	69.65	73.90	72.00	84.00	94.50
Minimum		95.00	110.00	120.00	61.00	69.00	74.00	70.00	85.00	90.00
Maximum		80	100	110	46	54	58	55	70	90
Percentiles		110	120	130	77	78	85	80	90	100
		90.00	100.00	112.50	59.00	66.00	70.75	70.00	80.00	90.00
		95.00	110.00	120.00	61.00	69.00	74.00	70.00	85.00	90.00
		100.00	117.50	130.00	70.00	75.00	78.00	80.00	90.00	100.00
IQR	25 50 75	10	17.50	17.5	11	9	7.25	10	10	10

In Group A patients, the mean post operative range of movements were significantly improved for the follow-up at every 3months with the mean ROM of 120° achieved at 1year follow-up. The ROM has significantly improved from 90° at 3<sup>rd</sup> month follow- up to 120° at 1year follow-up. The mean KSS knee and functional score were gradually improved in post operatively in 3<sup>rd</sup>, 6<sup>th</sup> and 1year follow-up compared to the pre operative KSS score. The KSS Knee score corresponds to the patient's objective score and hence there is an improvement in the objective score and patient's were relieved of symptoms.

**Table 4: Statistics of Group B**

		Post_op_3M	Post_op_6M	Post_op_1year	Knee_3M	Knee_6M	Knee_1yr	Fun_3M	Fun_6M	Fun_1Yr
N Valid	25	20	20	20	20	20	20	20	20	20
Missing	50	0	0	0	0	0	0	0	0	0
Mean		97.00	109.50	122.00	60.05	66.25	72.00	73.75	83.25	91.50
Median		100.00	110.00	120.00	60.00	67.00	71.50	75.00	80.00	90.00
Minimum		90	100	110	49	50	57	55	70	80
Maximum		110	120	130	69	78	84	80	90	100
Percentiles		90.00	102.50	120.00	59.00	63.50	69.25	70.00	80.00	90.00
		100.00	110.00	120.00	60.00	67.00	71.50	75.00	80.00	90.00
		100.00	110.00	130.00	64.75	68.00	75.00	80.00	90.00	100.00
IQR	75	10	7.5	10	5.75	4.5	5.75	10	10	10

In Group B patients, the mean post operative range of movements were significantly improved for the follow-up at every 3months with the mean ROM of 120° achieved at 1year follow-up. The ROM has significantly improved from 97° at 3<sup>rd</sup> month follow-up to 122° at 1year follow-up. The mean KSS knee and functional score were gradually improved in post operatively in 3<sup>rd</sup>, 6<sup>th</sup> and 1year follow-up compared to the pre operative KSS score. The KSS Knee score corresponds to the patient's objective score and hence there is an improvement in the objective score and patient's were relieved of symptoms.

**Table 5: Statistical analysis of both groups**

	Test Statistics								
	Post_op_rom_3M	Post_6M	Post_op_1Y	Knee_score_3M	Knee_score_6M	Post_op_knee_1year	Fun_score_3M	Fun_score_6M	Fun_score_1yr
Mann-Whitney U	172.000	183.500	178.500	143.500	138.000	163.000	176.500	187.000	158.000
Wilcoxon W	382.000	393.500	388.500	353.500	348.000	373.000	386.500	397.000	368.000
Z	-.838	-.480	-.630	-1.546	-1.688	-1.007	-.697	-.386	-1.262
Asymp. Sig. (2-tailed)	.402	.631	.528	.122	.091	.314	.486	.699	.207
Exact Sig. [2*(1-tailed Sig.)]	.461 <sup>b</sup>	.659 <sup>b</sup>	.565 <sup>b</sup>	.127 <sup>b</sup>	.096 <sup>b</sup>	.327 <sup>b</sup>	.529 <sup>b</sup>	.738 <sup>b</sup>	.265 <sup>b</sup>

a. Grouping Variable: Groups

b. Not corrected for ties.

Since P value >0.05 for Post op ROM 3M,6M,1Year there is no significant difference between Group A and Group B. P value>0.05 Knee Score 3M,6M,1year there is no significant difference between Group A and Group B.

P value>0.05 Fun Score 3M,6M,1 year there is no significant difference between Group A and Group B.

## Discussion

In total knee arthroplasties, both mobile-bearing and fixed-bearing prostheses were compared in terms of performance and survival, with overall revision rates of about 1% per year for both types of implants. In terms of clinical function or longevity, no prior controlled comparison has been able to establish any benefit for a mobile-bearing complete knee prosthesis over a fixed-bearing total knee prosthesis.<sup>7,8</sup> The goal of this study was to compare the individual performance of fixed-bearing versus mobile-bearing knee replacements in the same clinical context while controlling for characteristics including age, weight, and activity level.

The senior surgeon conducted all of the procedures. Patients were blinded to the kind of implant used in each knee when doing the clinical evaluation. As a result, patient-related bias was reduced. Both arthroplasties yielded similar clinical outcomes. Based on the size of the series, there was no benefit of the mobile bearing knee over the fixed-bearing knee

in terms of overall knee score, postoperative range of motion, or survival rate.

In both groups, 90% had excellent or good outcomes. In both groups, some patients experienced stiffness. Following a fall, one patient had a patellar tendon rupture, which was subsequently repaired. In revolving platforms, no spin off or dislocation has happened.

Despite the fact that their designs are different, Post et al. observed that both mobile-bearing and fixed-bearing implants exhibited comparable kinematic patterns in terms of posterior femoral translation and tibiofemoral rotation in experimental research. They proposed that the movable tibial insert stops moving at <90° degrees of flexion and that the prosthesis thereafter functions effectively as a fixed-bearing implant.<sup>9</sup>

Delpont et al. observed similar findings.<sup>10</sup> The current study's clinical findings are in line with the findings of these experimental trials. Both the fixed-bearing and mobile-bearing groups showed similar postoperative ranges of motion, suggesting that their in vivo kinematics are similar.

With every movable bearing, dislocation is a possible problem. Knee replacement is no exception, and the LCS prosthesis is no exception. In our series, some individuals in both groups had knee stiffness. Following a previous fall, one patient's patellar

tendon ruptured. In rotating platform knees, there is no spin off or dislocation of the knee.

With the figures provided, there was no significant difference in the rates of survival between the two prostheses. Because of the limited number of patients analysed and the short duration of the investigation, this study may suffer from a lack of statistical power. With the figures provided, no advantage of the mobile-bearing design over the fixed-bearing design could be proven.

## Conclusion

The post-operative range of motion and the Knee Society functional score were similar in both groups. Because of the short term research of one year, there was no significant statistical difference between the two groups of Total Knee Arthroplasty in terms of post-operative range of motion and functional outcomes. The long-term follow-up will evaluate whether either group has an increased rate of wear or loosening.

**Ethical Clearance:** The ethical clearance was obtained from the Yenepoya Medical College institutional ethics committee prior to the commencement of the study

**Conflict of interest:** Nil

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