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COMPARISON OF FIXED BEARING AND MOBILE BEARING DEVICES IN TOTAL KNEE ARTHROPLASTY

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ABSTRACT

Aim: In order to differentiate the clinical solutions of mobile bearing versus implant of fixed bearings during arthroplasty of total knee. **Methodology:** A total of 36 patients with implants of fixed bearing and 28 with implants of mobile bearing were studied. Those above 45 years of age and presented with grade 3 or 4 arthritis of knee were included. Patients were followed up at 1 month, 3month, 1 year and then yearly. Clinical evaluation was done by knee society clinical grading system after a minimum follow up of 1 year. **Results:** There was a significant increase in clinical knee society score from a pre-operative score of 55.83± 5.262 to 84.58±8.550 in the group of fixed bearing, while it increased from 57.43±3.371 to 88.07±6.633 in the knee group of mobile bearing. The functional knee society score increased from 32.64±14.952 to 84.58± 8.483 in fixed bearing and from 36.25±21.8 to 85.71±7.034 in the group of mobile bearing.There was statistically significant difference in the scores. However, when we compared both the implants, none was superior. The pre-operative range of motion increased from 86.25±10.027 to 120.33±17.342 in fixed bearing and from 84.32±8.251 to 122.43±15.262 in the mobile bearing group. This increase was significant based on statistics. **Conclusion:** High flexion and standard fixed bearing devices were both similar in results, indicating that proper patient selection and precise surgical techniques remains the gold standard principles in order to achieve optimum outcome after total knee arthroplasty

INTRODUCTION

Arthroplasty of Total knee has become the standard modality of treatment for end stage osteoarthritis and rheumatoid arthritis of knee. Primarily intended to decrease pain and increase function, the procedure has endured a lot of changes with respect to implant selection, implant design and surgical techniques. Conventional "implant of fixed bearings" have borne excellent outcomes over the long term with studies showing 95 percent survival at 10 years follow up. [1] The average knee flexion achieved after fixed bearing knee designs ranges from 110 to 115 degrees.[2]

The lack of congruency caused implant of fixed bearings to have increased wear and hence aseptic loosening. Thus, rotating platform devices with more tibiofemoral congruency, less wear and decreased stresses at interface of bone-implant were invented.[3]

Despite this several studies indicate no clear superiority of devices of mobile bearing more than devices of fixed bearing.[4-7]The study aimed to thus differentiate the outcome of clinical tests of mobile bearing and implant of fixed bearings.

MATERIALS AND METHODS

This prospective study of five years duration included the Patients who were operated between January 2014 and December 2018, were selected to investigate in the study at tertiary care centre. The study was started after appropriate ethics committee approval. 36 patients with implant of fixed bearings labelled as group 1 and 28 with implant of mobile bearings labelled as group 2 were observed.

All patients operated with the inclusion criteria, over 45 years of age, had grade 3 or 4 arthritis of knee and had gained no relief by other conventional methods. The exclusion criteria were Flexion contracture > 30-degree, Valgus deformity > 10 degrees, BMI >30 kg/m2, Varus deformity > 20 degrees. Both groups received identical postoperative medicines and physiotherapy. All patients were followed up at 1month, 3 months, 1 year and then yearly. Patients were then clinically evaluated by Knee society clinical grading system after a minimum follow up of 1 year.

Study Analysis:

The current study included both descriptive and inferential statistical analysis. The results for continuous measures were shown as Mean SD. Any value < or = 0.05 was regarded as statistically significant, and the significance level is symbolised as p which is = 0.05.

In order to determine the significance of study parameters on a continuous scale within and between two groups (intra group & intergroup analysis), the student t test (two-tailed, paired & unpaired) was utilised.

RESULTS

The study included 64 patients with male to female ratio of 3:5. The mean follow up was 48 months.

Table 1: Using An Unpaired T Test, Compare The Ages Of The Two Groups In Terms Of Mean (SD)

Group	N	Mean	Std. Deviation	t value	P value
Group 1	36	62.58	7.806	0.704	0.484
Group 2	28	63.82	5.742		

Table 2: Using A Paired t-test, the KSKS, KSFS, and ROM Scores Were Compared Between Groups 1 And 2 At Various Time Points

Variable	Fixed bearing		Mobile bearing	
	Pre-op	Post op	Pre op	Post op
ROM	86.25 ± 10.027	120.33 ± 17.342	84.32 ± 8.251	122.43 ± 15.262
KSKS	55.83 ± 5.262	84.58 ± 8.550	57.43 ± 3.371	88.07 ± 6.633
KSFS	32.64 ± 14.952	84.58 ± 8.483	36.25 ± 21.8	85.71 ± 7.034

Knee Society Scores

The clinical score of knee society significantly increased from a preoperative score of 55.83 ± 5.262 to 84.58 ± 8.550 in the group of fixed bearing while it increased from 57.43 ± 3.371 to 88.07 ± 6.633 in the mobile bearing knee group (Table 2).

The functional score of knee society increased from 32.64 ± 14.952 to 84.58 ± 8.483 in fixed bearing and from 36.25 ± 21.8 to 85.71 ± 7.034 in the group of mobile bearing.

The increase in the scores was statistically significant indicating that both modalities of treatment give good to excellent results. However, on comparing the two implants there was no clear winner.

Range Of Motion

The motion post operative range increased from 86.25 ± 10.027 to 120.33 ± 17.342 in fixed bearing and from 84.32 ± 8.251 to 122.43 ± 15.262 in the group of mobile bearing. The Increase was statistically significant.

DISCUSSION

The modern Posterior stabilized total knee arthroplasty originated back in 2000 while the newer high flexion devices aka rotating platform devices originated in 2005. Total knee arthroplasty has revolutionized the outcomes in end stage arthritis of knee leading to decreased pain, increased function, and increase in activities of daily living as indicated by various studies.[1,3,5,6,7]

With increased demands and expectations of the 21st century activities like squatting, sitting cross legged, kneeling are considered to be routine activities So, in spite of excellent functional outcomes after fixed bearing total knee arthroplasty, shortcomings do persist. [8] This led to the emergence of high flexion or mobile bearing devices which allowed motion at the tibial base plate and poly interface which in turn was believed to increase the flexion at knee and increase longevity of the implant. This movement at 2 interfaces helps in mimicking natural knee biomechanics thus allowing predictable femoral rollback and increased knee flexion (Figure1).[9]

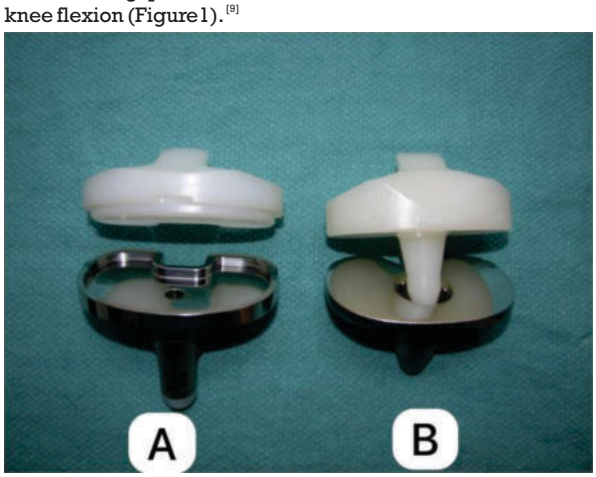

Figure 1: *A:Fixed bearing implant B:Mobile bearing implant*

The maximum amount of distraction before dislocation of stem occurs is known as the Jump distance. These implants have developed jump distance so as to prevent dislocations at higher degrees of flexion and to ensure a predictable femoral rollback.

Range Of Motion:

The average post op knee ROM was 120 degrees for fixed bearing as compared to 122.43 degrees for Hi flexion implants. However, the difference was not statistically significant. This is in accordance with various studies as noted below.[10-12]

In a study by Kim et al. the post operative range of motion was found to be 135.8 degrees (105-150) in standard knee prosthesis as compared to 138.6 degree (105-150) in High flexion prosthesis. However, this difference was no statistically significant. [13] Murphy et al in a systemic review did not find any significant improvement in either range of motion or functional scores when they compared fixed bearing vs High flexion devices.[14]

Similarly various other studies show no difference in ROM between the two. [11,15] According to Dennis et al. knee flexion after knee arthroplasty depends upon various factors such as approach used, Surgical technique, Post operative rehabilitation, Pre operative knee flexion, Knee kinematics. [16,17] Hence only Implant design has little effect on overall functional outcome and knee ROM.

Functional Scores:

There was a statistically significant increase in the scores post operatively in both the groups indicating that both types of implants have good to excellent functional outcomes post operatively. In a study by Suh et al similar implant systems were compared and were found to have similar clinical outcomes. [18] Similarly Gandhi et al found increased range of motion in Implant of mobile bearings but no difference in Knee society scores.[19]

This study has also not found the superiority of any implants over one another as far as the Clinical scores are concerned.

Complications:

We encountered a single case of subacute infection.

Increased posterior cut in high flexion devices leads to a theoretical risk of weakening and subsequent periprosthetic fracture. But we have not encountered such case in our study. Indian knees are smaller as compared to the European counterparts hence increased bone removal also makes revision difficult.

The term spinout refers to the spinning out of one end of the insert out of the joint while the other end remains inside. Several studies indicate a spin out rate of 0 % to 9.3% but we have not encountered a spin out of the rotating poly in our series.[20-21]

We believe that strength of our study lies in the fact that all the surgeries were performed by a single surgeon using medial parapatellar approach thus eliminating surgeon bias. The drawbacks were lack of a long term follow up.

CONCLUSION

The study states that there is no statistical difference in clinical range of motion, Knee scores and complication rates in high flexion and standard fixed bearing devices. Hence patient selection should be done properly and the surgical techniques should be controlled precisely. These are still the gold standard principles in order to achieve an optimal outcome after arthroplasty of total knee.

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