Original Article

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Effects of Coronal Plane and Sagittal Plane Deformities on Post operative Range of Motion Following Total Knee Arthroplasty in Indian Population

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Abstract

Introduction: *The success of knee arthroplasty is closely linked to post operative range of motion .The presence of fixed deformities pre operatively may have an adverse effect on the same .This study aims to assess the relationship between sagittal and coronal plane deformities with post operative range of motion following knee replacement in Indian patients*

Materials and methods: *The study included 354 primary total knee replacements among 254 patients which were operated at a rural teaching hospital in india. The patients were followed up for a minimum duration of 6 months, with a maximum follow up of 2 years. The range of motion was noted at consecutive visits and the results were statistically analysed to assess any difference in the patients with pre operative fixed deformities (saggital of coronal).*

Results: *The mean age was 63.8years with a range of 50 – 80 years with 50.8% of patient in 60 – 69 year age group.Fixed flexion deformity ranged from 0 – 40 with a mean of 10.5 and SD of 10.9. Varus deformity ranged between 0 – 30 with mean of 11.8 and SD of 6.1. Valgus deformity also ranged between 0 – 30 with mean of 12.6 and SD of 10.6.The fixed flexion deformity had a negative correlation with the postoperative range of motion preoperatively(r-0.64) , at 3months(r-0.56) , at 6 months(r-0.53) , at 1 year(r-0.67).however at 2 years there was no correlation (r -0.45).Varus deformity , valgus deformity , mediolateral and anteroposterior instability posterior tibial slope had no correlation with postoperative range of motion at all the points of follow up.*

Conclusion : *Corronal plane deformities (valgus or varus) had no correlation with the post operative range of motion . the presence of fixed flexion deformity had negative correlation at initial follow up , however at one year follow up there was no difference . We can conclude that the presence of these fixed deformities should not lead to a significant impact on range of movements after knee replacement.*

Introduction

Paramount indicator of the functional ability of total knee arthroplasty is postoperative range of motion . It has been found to be positively associated with knee function scores, walking ability and stair climbing activity. Increased motion is associated with improved function and increased patient satisfaction. Patients require a range of 70 degrees to 90degrees of flexion for activities of walking and climbing up and down the stairs. Flexion exceeding 105 degree is obligatory for kneeling and squatting during activities of daily living and for religious acts in Indian population. Numerous reports have delineated the factors instrumenting range of motion after total knee arthroplasty. Amidst the important factors are Preoperative range of motion, obesity, patients age, preoperative knee function score, and postoperative physiotherapy. The importance of other potential factors like the presence of saggital and/or coronal plane deformities and soft tissue balancing is less well documented. There is paucity of data about the effects of these factors on range of motion after total knee arthroplasty on Indian patients which prompted us to undertake this study. This is significant as most patients in India present late for knee arthroplasty due to economic constraints and therefore have fixed deformities at the time of surgery. The presence of these deformities may have an adverse effect on post operative functional outcomes which may lead to apprehension in the population about undergoing the procedure This study aims to assess the relationship between sagittal and coronal plane deformities with post operative range of motioninTKR in age group of 50 yrs to 8 0yrs in a rural teaching hospital.

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Methods

Data was colleted for all those patients with advanced arthritis of knee who underwent primary, knee arthoplasty at a rural teaching hospital during the period for August 2009 to August 2015. Patients undergoing revision replacements, having systemic and local infections or with previous osteotomies or patellectomy were excluded from the study. 354 primary total knee replacements among 254 patients were included in the study.. Modified Insall's knee society scoring was used to assign knee scores pre operatively Standing AP and lateral views of both knees and full length AP view of both lower limbs involving hip, knee and ankle were done for all patients. Depending upon the physiological age and

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medical fitness with their associated comorbidities, patients with bilateral advanced arthritis underwent total knee replacement in single anesthesia (bilateral single stage) or staggered with a gap of 2 to 7 days between surgeries or under two separate hospitalisations (bilateral staggered). The mean age was 63.8years with a range of 50 – 80 years with 50.8% of patient in 60 – 69 year age group. Females predominated in this study with 66.1 % and 33.9% were male. The preoperative diagnosis was osteoarthritis in 81.1% of patients and 18.9% had rheumatoid arthritis. The length of hospitalisation ranged from 6 -23 days with a mean of 10. 154 patients(60.6%) underwent unilateral knee replacement and 100 patients underwent bilateral knee replacement, out of which 18.1% had single stage and 21.3% had staggered bilateral . Fixed flexion deformity ranged from 0 – 40 with a mean of 10.5 and SD of 10.9. Varus deformity ranged between 0 – 30 with mean of 11.8 and SD of 6.1. Valgus deformity also ranged between 0 – 30 with mean of 12.6 and SD of 10.6. Mediolateral instability of <5mm was present in 3.4 % , 5-10mm in 35.8 % and >10mm in 60.8 % . Anteroposterior instability of <5mm was present in 26.5% , 5-10mm was present in 65% and >10mm was present in 35.4 % . Medial release of the knee was required in 49.2% patients and posterior release in 12.7% with 21.7% of patients requiring lateral retinaculum release for maltracking of patella . All poly implant was used in 83.1% of patients and in 16.9% of patients metal backed was used. Augmentation was required in the form of extension rods or bone grafts or wedges in 2.3% of the patients. Postoperative epidural analgesia was given for 3 to 4 days. Postoperative pain protocol included oral analgesics and injectable analgesics withVAS more than 5. Full weight bearing permitted from the first postoperative day with the help of walker. Knee bending exercises and static exerciseswere also started from the firstpostoperative day. Post operative radiograph (AP and lateral) view were taken to see the prosthetic positioning in both sagittal and coronal planes. Sutures were removed on14th postoperative day. .Postoperative range of motions and knee scores were recorded during the subsequent follow ups at 3 months , 6 months , 1 year and 2 year. All the patients were avai able for follow up with a maximum of 2years (12.2%) , 1year follow up (66.14%) and a minimum follow up of 6 months (21.66%).

Data analysis and results:

EPI (2010)and Excel software were utilisedfor data analysis. Using them range, frequencies, percentages, means, standard deviations, chi square 'p' values and correlation coefficients were calculated. Kruskul Wallis chi-square test was used to test the significance of difference between quantitative variables and Yate's chi square test for qualitative variables.

REF TO TABLE NO 1:

Table 1: Correlation of various factors with range of motion at various time intervals

Factors	Correlation coefficient with range of motion				
	Pre op.	3 months	6 months	1 year	2 years
Pre op. Range of Motion	-	0.7	0.68	0.71	0.61
Posterior Tibial Slope	-0.03	-0.03	-0.01	0.01	0.06
Fixed flexion deformity	-0.64	-0.56	-0.53	-0.67	-0.45
Varus deformity	-0.06	-0.06	-0.1	-0.01	0.43
Valgus deformity	0.28	-0.26	0.07	-0.36	0.16
Mediolateral Instability	-0.15	-0.1	-0.12	-0.2	0.11
Antero posterior Instability	0.02	-0.09	-0.07	0.01	-0.09

Results:

The posterior tibial slope had no correlation with the postoperative range of motion at all the points of follow up.The fixed flexion deformity had a negative correlation with the postoperative range of motion preoperatively(r-0.64) , at 3months(r-0.56) , at 6 months(r-0.53) , at 1 year(r-0.67).however at 2 years there was no correlation (r -0.45).Varus deformity , valgus deformity , mediolateral and anteroposterior instability posterior tibial slope had no correlation with postoperative range of motion at all the points of follow up.

Discussion:

The data on the impact of coronal plane tibio femoral deformities on post operative range of movement is conflicting. Farahini et al had concluded that these deformities had a significant influence on the post operative range of movement. However this study, along with other studies by Kawamura et al2and Shurman et al3 are suggestive that post operative range of movements were not different in the presence of pre operative valgus or varus deformities. We speculate that if soft tissue releases are correctly performed with restoration of the mechanical tibiofemoral axis , almost similar

results of post operative range of motion can be expected in these patients The findings regarding fixed flexion deformity have been uniform across most literature available , including this study. Interestingly, even though fixed flexion deformity had a negative correlation with post operative ROM upto 1 year,at the end of 2 years the effect was not statistically significant. This finding is suggestive that soft tissue contractures correct over a period of time and some improvement can be expected in pre operatively "tight" knees , if correct bony alignment is achieved Some authors have hypothesized that proximal tibial slope influences postoperative ROM1. Walker and Garg4, in a computer modeling study, attempted to determine the effect of proximal tibial slope on postoperative ROM. The effects of a 10 degree posterior tilt, neutral tilt, and a 10 degree anterior tilt were compared. He concluded that a 10 degree posterior tilt produced no less than 30 degree of additional flexion when compared with the neutral tilt and anterior tilt had the opposite effect. Although one could expect these results in a computer simulation, the model may have overlooked some very important anatomical and physiological variables. Clearly, the in vivo situation varies significantly from the analytical computer modeling because of confounding variables. In 2006 Devanshu kansara5 published his reports on effect of posterior tibial slope on range of motion after total knee arthroplasty and found that increasing posterior slope did not result in significant increase in range of motion or hospital for special surgery functional score.This study also did not find any correlation between the posterior tibial slope and postoperative range of motion. Sharma et al 6 reported the varus-valgus motion in joints with osteoarthritis is greater than the varus-valgus motion in healthy, age-matched control subjects, and varus-valgus motion is increased with increased severity of osteoarthritis. In this study we found that in knees with a coronal plane laxity the post operative range of motion was similar to knees without any laxity.

Conclusion:

In age group of 50 to 80 yrs, varus and valgus deformities and pre operative instabilities have no influence on post operative range of movements in total knee arthroplasty in a teaching hospital. Fixed flexion deformity does restrict the range of motion initially, however with time this corrects as well.

References

1. H Farahini,1 M Moghtadaei,1,* et al "Factors Influencing Range of Motion after Total Knee Arthroplasty" J Orthop Sci. 2001;6(3):248-52(. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3438434/)
2. Kawamura H1, Bourne RB et al "Factors affecting range of flexion after total knee arthroplasty." (https://www.ncbi.nlm.nih.gov/pubmed/11484119)
3. Schurman DJ, Matityahu A, Good SB et al "Prediction of postoperative knee flexion in Insall- Burstein II total knee arthroplasty".Clin Orthop 1998;353:175. (https://www.ncbi.nlm.nih.gov/pubmed/9728172)
4. Walker PS, Garg A et al "Range of motion in total knee arthroplasty. A computer analysis" Clin Orthop 1991;262:227(https://www.ncbi.nlm.nih.gov/pubmed/1984921)
5. Devanshu Kansara, MD,David C. Markel, MD et al "The Effect of Posterior Tibial Slope on Range of Motion After Total Knee Arthroplasty"The journal of arthroplastySeptember 2006Volume 21, Issue 6, Pages 809–813(http://www.arthroplastyjournal.org/article/S0883-5403(05)00639-X/abstract)
6. Sharma L, Lou C, Felson DT, Dunlop DD, Kirwan-Mellis G, Hayes KW, Weinrach D, Buchanan TS. Laxity in healthy and osteoarthritic knees. Arthritis Rheum. 1999;42:861–870 (https://www.ncbi.nlm.nih.gov/pubmed/10323441)

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