

## ORIGINAL ARTICLE

**VIMSJPT** Effectiveness of Structured Physiotherapy Intervention on Pain, Proprioception and Balance in Total Knee Arthroplasty :Pre and post test Pilot study.<sup>1</sup>Priyanka Jadhav, <sup>2</sup>Dr. Deepak Anap(PhD)

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**ABSTRACT:**

**Background:** Patients with severe knee osteoarthritis requires Total knee arthroplasty (TKA). TKA is a surgical procedure to replace the weight bearing surfaces of the knee joint to reduce pain and disability. The main aim of this study is to find out the effectiveness of structured physiotherapy intervention on pain, proprioception and balance in patients with TKA. **Material and Methods:** 10 participants were included in this pilot study with unilateral TKA. Structured physiotherapy intervention was given for 4 weeks post TKA. Outcomes were assessed at baseline, 2 weeks and at 4 weeks after structured physiotherapy intervention. **Results:** Pain decreased significantly from baseline (60.50%), balance (28.40%) and knee ROM (31.81%) have been improved. There was only 5.63% change in joint proprioception from its baseline values. **Conclusion:** After 4 weeks of Structured Physiotherapy intervention we found a significant reduction in pain and improvement in balance and knee ROM while there was no improvement in knee joint proprioception. However, adequate powered RCTs are needed to determine the long term effect of exercise therapy on pain, proprioception and balance after TKA.

**Keywords:** Knee OA, TKR, pain, proprioception, balance, physiotherapy interventionReceived 6<sup>th</sup> Dec 2019, Accepted 19<sup>th</sup> Dec 2019, Published 26<sup>th</sup> Dec 2019[www.vimsptcr.in](http://www.vimsptcr.in)**CORRESPONDING AUTHOR****Priyanka Jadhav**

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## INTRODUCTION

Osteoarthritis (OA) is a degenerative and progressive joint disease that affects mainly weight-bearing joints such as the hip, knee, and ankle. This is one of the leading causes of lower limb disabilities among the elderly. Degenerative OA of the knee is one of the most common forms of osteoarthritis worldwide. It causes a major loss of function and activity limitations as well as posing a considerable socio-economic burden on the societies and families due to disabilities. Knee OA results in progressive loss of function including: gait, stair climbing and other physical activities that involve lower limb. In fact, it reduces the quality of life.<sup>1</sup>

Patients with severe degenerative joint disease often require total knee arthroplasty to reduce pain, improve stability, and restore function. Re-establishing joint sensation and the ability to balance is important for maximization of patient outcome.<sup>2</sup>

Joint replacement (arthroplasty) is a surgical option for end stage arthritis, is well established now and millions of patients across the world have been benefited. Total knee arthroplasty (TKA) has become a reliable surgical procedure to treat painful degenerative arthritis.<sup>3</sup>

Postoperative pain, swelling, and bruising are a normal part of the recovery process following knee surgery. Evaluation of patients with pain after TKA is necessary for effective rehabilitation.<sup>4</sup>

Proprioception encompasses the senses of joint position and joint motion. In recent years, proprioception has been used to describe functional deficits in arthritic knees both, by joint position sense measurement and threshold detection measurement of passive knee motion.<sup>5</sup> A number of techniques for clinically examining proprioceptive acuity are described in the literature, including threshold detection of passive movement, the absolute method and joint position sense (JPS).<sup>6</sup>

Patients with severe hip and knee OA who are awaiting total hip arthroplasty (THA) or total knee arthroplasty (TKA) are reported to have a higher incidence of falls compared to the general population. The loss of balance response and increased incidence of falls is of concern to physical therapists. Improvement of balance may be a desired functional outcome for many patients.<sup>7</sup>

The Knee Injury and Osteoarthritis Outcome Score (KOOS) is a knee specific instrument developed to assess the patient's opinion about their knee. KOOS has been found to be a valid, reliable and responsive self-administered instrument in patients with knee injuries such as in patients with knee OA as well as in patients undergoing TKR.<sup>8</sup>

Rehabilitation after total knee replacement can markedly improve the function outcome and mobility in patients with knee osteoarthritis.<sup>9</sup> The present 4 week pilot trial aimed to determine the effectiveness of structured physiotherapy intervention on pain, proprioception and balance in patients with total knee arthroplasty.

## PARTICIPANTS AND METHOD

**Participants:** Participants were recruited from the waiting list of the orthopedic outpatient clinic for TKA of Vikhe Patil Memorial Hospital, Ahmednagar. 10 participants age between 50- 60 years, with moderate or severe restrictions in mobility, debilitating pain and difficulties in walking; stair climbing volunteered to participate in this pilot trial and gave informed consent. A brief health history, medication and lifestyle have been taken. Participants were then invited to a baseline examination, which included a written informed consent, physician's examination, questionnaires, and measurements of physical functioning.

Inclusion criteria were with unilateral total knee arthroplasty, either gender, age below 60 years. Exclusion criteria were contralateral knee pain, Central or vestibular affections that directly affect their balance, postoperative complications as possible infections, Musculoskeletal disease other than arthrosis, previous knee operations other than unilateral knee joint replacement and the recent injury to the lower extremity.

**Anthropometry:** Height and weight were measured with standard methods.

Outcomes assessed were a pain using KOOS scale<sup>10</sup>, proprioception using passive-active angle reproduction test<sup>11</sup>, balance using TUG test<sup>12</sup> and knee ROM at baseline, 2<sup>nd</sup> week and 4<sup>th</sup> week after Structured Physiotherapy Intervention. Each item in KOOS is responded on a Likert scale by marking one of five response options from 0 -best to 4-worst. For each subscale raw scores from 0 (extreme

problems) to 100 (no problems at all) are calculated separately.

Structured Physiotherapy Intervention (Annexure1)<sup>13</sup>: It constitutes AROM, stretching and strengthening exercises with 10 repetitions of each exercise, 2 sets, twice a day and 5 times a week.



Fig. 1: Quads Sets



Fig 2: Hams Sets



Fig 3: SLR



Fig. 4: Knee extension 45°-0°



Fig. 5: Knee extension 90°



Fig. 6: Heel slides

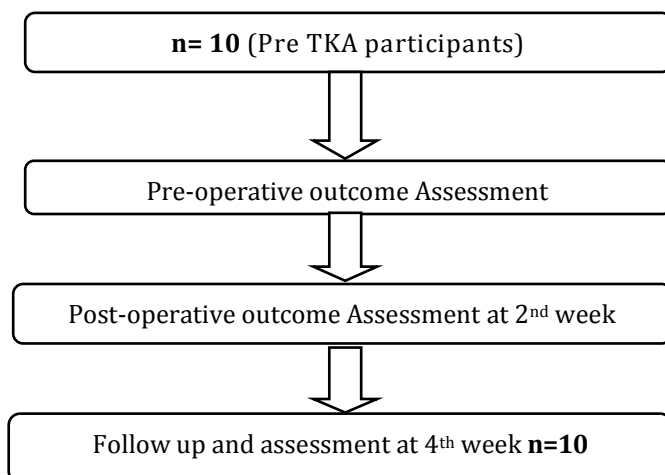


Fig. 7: Flow of participants through the trial

## STATISTICAL ANALYSIS

The result was analyzed using IBM SPSS Version 24.0.

Descriptive information is presented as means and standard deviations (SD). Repeated measures of ANOVA were used to compare changes over time.

## RESULT:

Table 1: Baseline Characteristics

Outcomes	Mean±SD
<b>Age</b>	55.8±3.425
<b>BMI</b>	30.43±3.825
<b>KOOS</b>	
Pain	25.01±7.517
Symptoms	25.03 ±7.34
ADL's	21.96±7.98
Functions	0.5±1.58
QOL	1.87± 4.21
<b>Proprioception</b>	7.1±4.332
<b>TUG</b>	116.1±24.763
<b>Knee ROM</b>	82.1±18.430

Table 1 shows the baseline characteristics of all the outcomes with their mean and SD.

Table 2: Comparison of various outcomes

	Pain Mean ± S.D.	Symp- toms Mean ± S.D.	ADL's Mean ± S.D.	Func- tion's Mean ± S.D.	QOL Mean ± S.D.
Base- line	25.01 ±7.51 7	25.03 ±7.34	21.96 ±7.98	0.5±1. 58	1.87± 4.21
2 <sup>nd</sup> week	42.25 ±6.14 4	66.81 ±8.75	56.37 ± 5.73	0.5±1. 58	19.37 ±7.48
4 <sup>th</sup> week	70.46 ±6.67	85.37 ±7.78	77.96 ±3.71	21±15 .59	59.61 ±12.18

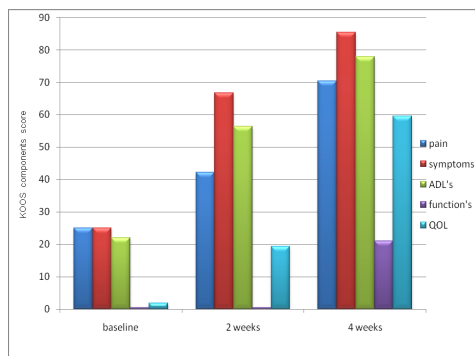


Fig. 8: Graph showing, within group comparison of KOOS pain score

A Friedman test for KOOS components showed that there was a significant difference in its all components between there intervals [ $p < 0.05$ ]. (Fig. 8 Table 2)

Dunn's Multiple Comparison as a post hoc test showed a significant difference between Baseline score and 4<sup>th</sup> Weeks score of all KOOS components ( $p < 0.05$ ).

**Table 3: Descriptive statistics of Proprioception, TUG and Knee ROM**

	Proprio-ception	TUG	Knee ROM
Baseline	7.1±4.33	17.6±11.3	82.1±18.43
2 <sup>nd</sup> week	7.2±3.49	16.53±8.15	101.7±16.16
4 <sup>th</sup> week	6.7±3.129	12.683±6.56	120.4±11.10

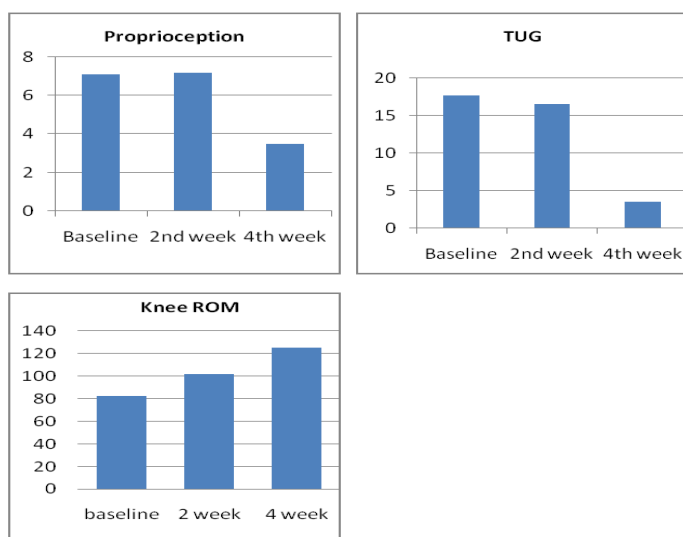


Fig. 9: Within group comparison of Proprioception, TUG and knee ROM.

A Friedman test showed that there was a non-significant difference in proprioception score [ $p > 0.05$ ], while the significant difference in TUG and knee ROM between there intervals [ $p < 0.05$ ]. Dunn's Multiple Comparison as a post hoc test for proprioception was not calculated because the p value was greater than 0.05 while it showed a significant difference between baseline score and 4<sup>th</sup> week score for TUG and knee ROM score. ( $p < 0.05$ ). (Fig. 9 Table 3)

## DISCUSSION

This pilot study's purpose was to find out the effectiveness of Structured Physiotherapy Intervention on Pain, Proprioception and Balance in TKA. As per the author's knowledge this is the first study to find out the short term effects of Structured Physiotherapy Intervention on Pain, Proprioception and Balance in TKA.

We found significant improvement in pain from baseline to 2<sup>nd</sup> and 4<sup>th</sup> week of physiotherapy intervention after TKA. Pharmacological pain control i.e. with the use of femoral nerve block or local infiltration analgesia allows tolerated active and passive knee mobilization. This early mobilization has already been proved to be effective for pain management than standard rehabilitation by Issac.<sup>14</sup>

For proprioception, the difference between the intervals was not significant. In most patients with TKA replicating joint position angle at 40° was difficult as it was the upper limit of available ROM and was painful. Improvement in angle reproduction was found at the end of 4<sup>th</sup> week but the result was not significant.<sup>11</sup>

Balance improvement was extremely significant at 4<sup>th</sup> week of physiotherapy intervention. In our study we concentrated on function-based and balance based training after total knee replacement. This improves patients' compensatory adjustment of knee joint proprioception, and stimulated the activation of an increased number of proprioceptors in the hip and ankle joints. These further increases facilitated neuromuscular feedback control. This helps to improve the dynamic balance control in older patients after total knee replacement, and might support the improvement of physical performance.<sup>15</sup>

The KOOS is a 42-item questionnaire with five-subsections, with acceptable psychometric properties.

However, the sport and recreational, and other symptoms subscales, demonstrate low reliability in total knee replacement and the applicability of the sport and recreation subscale in patients that are less physically active, has been questioned. For all subscales of the KOOS scale except for functions we found significant results.<sup>16</sup>

ROM improved after 2 and 4 weeks of intervention. This could be because as we started with an exercise program early in the rehabilitation.<sup>17</sup>

Effective exercise after TKA also requires motivated participants. Our training was started at low intensity and level of difficulty. Since group sizes were small, the therapist was able to pay individual attention to guide the motions. This resulted in excellent training compliance for over 4 weeks. Compliance may be more difficult to maintain over a longer duration.

Knee musculature strength should have been considered for a better result for knee functions and proprioception. Further controlled studies with larger group sizes are needed to determine the long-term benefits of exercise.

## CONCLUSION

After 4 weeks of Structured Physiotherapy intervention we found significant improvement in pain, balance and knee ROM while there was no improvement in knee joint proprioception. However, adequate powered RCTs are needed to determine the long term effect of exercise therapy on pain, proprioception and balance in patients after TKA.

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**Conflict of Interest :** None reported

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### ANNEXURE 1

Structured Physiotherapy Knee Rehabilitation Program:

<b>Week 1</b>	
Cryotherapy	Thrice a day
Weight-bearing: Walker	Twice a day for 5 minutes
Ankle pumps with leg elevation.	10 reps x 2 sets, twice a day
Passive knee extension exercise.	10 reps x 2 sets, twice a day
SLR	10 reps x 2 sets, twice a day
Quad sets	10 reps x 2 sets, twice a day
Hams sets	10 reps x 2 sets, twice a day
Knee extension exercise 90-30 degrees	10 reps x 2 sets, twice a day
Heel slides	10 reps x 2 sets, twice a day
<b>Week 2</b>	
Weight-bearing: WBAT with an assistive device	Twice a day for 15 minutes
Quad sets	10 reps x 2 sets, twice a day
Knee extension exercise 90-0 degrees	10 reps x 2 sets, twice a day
Terminal knee extension 45-0 degrees	10 reps x 2 sets, twice a day
SLR (flexion-extension)	10 reps x 2 sets, twice a day
Hip abduction-adduction	10 reps x 2 sets, twice a day
Hamstring curls	10 reps x 2 sets, twice a day
Mini squats	10 reps x 2 sets, twice a day
Stretching: Hamstrings, gastrocnemius, soleus, quads	10 reps x 2 sets, twice a day
<b>Week 3</b>	
SLR	10 reps x 2 sets, twice a day
Quadricep sets	10 reps x 2 sets, twice a day
Hip Abduction- adduction	10 reps x 2 sets, twice a day
Hamstring Curl	10 reps x 2 sets, twice a day
Mini squats	10 reps x 2 sets, twice a day
<b>Week 4</b>	
Continuing all 3 <sup>rd</sup> week exercises	
Front and lateral step ups	10 reps x 2 sets, twice a day
Front lunges	10 reps x 2 sets, twice a day

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