

Research Paper

The Effect of Early Hip-strengthening on Physical Function in Patients With Unilateral Total Knee Arthroplasty



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Citation: Moaref Khanli M, Akbari M, Amiri A. [The Effect of Early Hip-strengthening on Physical Function in Patients With Unilateral Total Knee Arthroplasty (Persian)]. Journal of Arak University of Medical Sciences(JAMS). 2021; 23(6):912-925. <https://doi.org/10.32598/JAMS.23.6.6045.1>

 <https://doi.org/10.32598/JAMS.23.6.6045.1>



Article Info:

Received: 29 Nov 2019

Accepted: 24 Aug 2020

Available Online: 01 Feb 2021

ABSTRACT

Background and Aim Conventional post-operative rehabilitation programs focus on quadriceps strengthening and knee range of motion. However, hip muscle weakness is evident in patients with knee osteoarthritis. The present trial study aimed to investigate the effects of adding early hip muscle strengthening exercises to conventional rehabilitation programs on pain, Range of Motion (RoM), Quality of Life (QoL), and physical function in patients with unilateral Total Knee Arthroplasty (TKA).

Methods & Materials The intervention was initiated from the second day after surgery and continued for 10 sessions, 3 times a week on 24 participants in the control and intervention groups. Both research groups received Transcutaneous Electrical Neural Stimulation (TENS) and Infra-Red (IR), followed by exercises. The control group performed knee extensor and flexor strengthening and RoM exercises. The intervention group conducted hip-strengthening exercises in addition. Outcome measures included pain, knee flexion, and extension RoM, and QoL using the 36-Item Short Form Survey (SF-36), Timed Up and Go (TUG) test, Step Test, Six-Minute Walk Test (6MWT), and Hip and Knee Muscle Strength test.

Ethical Considerations This research was approved by the Research Ethics Committee of Iran University of Medical Sciences (IR.IUMS.REC.1396.9511340012) and it was registered in the Clinical Trial Registration Center (Code: IRCT 20150314021459N6).

Results All outcome measures improved in both research groups. The improvement in the scores of pain ($P=0.03$), knee extension RoM ($P=0.007$), and TUG test ($P=0.033$) were significantly higher in the intervention group, compared to the control group. The strength of knee flexors ($P=0.023$), hip flexors ($P=0.040$), hip extensors ($P=0.028$), hip adductors ($P=0.040$), and hip external rotators ($P=0.047$) significantly improved higher in the intervention group.

Conclusion According to the present research results, both treatment approaches were effective on patients with unilateral total knee arthroplasty. Considering the better result of some of the outcome measures in the intervention group, the addition of hip strengthening exercises to knee exercises can be useful.

Keywords:

Knee, Arthroplasty,
Hip strengthening,
Physical function

Extended Abstract

1. Introduction

B

ackground: The focus of the conventional treatment program after knee replacement

surgery is on strengthening the quadriceps muscle and the Range of Motion (RoM) of the knee; however, the weakness of other thigh muscles is observed in patients with knee osteoarthritis. The present study aimed to evaluate the effects of strengthening the muscles around the hip joint on pain,

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Table 1. Demographic characteristics of the study participants

Demographic Profile	Mean±SD	Domain
Age (years)	56.50±9.04	53-86
Height (m)	1.59±0.07	1.46_1.80
Weight (kg)	70.33±10.22	50-86
Body mass index (kg/m ²)	27.61±3.79	19.85_35.84

RoM, Quality of Life (QoL), and performance in patients undergoing complete unilateral knee replacement surgery.

2. Materials and Methods

This study was performed from the second-day post-surgery for 10 sessions daily among 24 subjects divided into the control [routine exercises + Transcutaneous Electrical Neural Stimulation (TENS) & Infra-Red (IR)] and treatment (control group + thigh muscle strengthening exercises) groups. The measurement criteria included pain, the amplitude of knee flexion and extension, QoL (the 36-Item Short Form Survey; SF-36), Timed Up and Go (TUG) test, Step Test, Six-Minute Walk Test (6MWT), and Hip and Knee Muscle Strength test.

3. Results

All evaluation criteria were improved in both research groups, indicating the effectiveness of both presented approaches. Pain ($P=0.03$), extension range ($P=0.007$), TUG

test and Step Test ($P=0.033$), and the strength of knee flexor muscles ($P=0.023$), thigh flexor ($P=0.040$), thigh extensor ($P=0.028$), thigh adjustor ($P=0.040$), and external hip rotator ($P=0.047$) provided a significant improvement in the experimental group, compared to the control group.

4. Discussion and Conclusion

According to the present study findings, both conventional physiotherapy and conventional physiotherapy combined with strengthening the thigh muscles can be effective in improving the results obtained after complete unilateral knee replacement surgery. The outcome of routine physiotherapy treatment with thigh muscle strengthening was more effective in some variables. Some studies revealed that thigh muscle strengthening in addition to routine treatment can be effective in improving functional outcomes months after surgery. Thus, physiotherapists are recommended to implement the tested method in this research to treat patients with complete one-sided replacement of the knee joint. Accordingly, they are suggested to use early strengthening of the

Table 2. Comparing the dependent variables with abnormal distribution between the control group and the post-intervention test using the Mann-Whitney U test

Dependent Variable	Z	P
Pain	-2.155	0.03*
TUG test	-1.790	0.073
STEP test	-2.136	0.033*
Quadriceps	-1.501	0.133
Hamstring	-2.281	0.023*
Hip flexor	-2.050	0.040*
Hip extensor	-2.194	0.028*
Hip adductor	-2.050	0.040*

$P=0/05$

Table 3. Comparing the dependent variables with normal distribution between the control group and the post-intervention test using the Independent Samples t-test

Dependent Variable	Mean Diff.	Standard Error Diff.	95% Confidence Interval		t	P	
			Max.	Min.			
RoM	Flexion	-0.167	3.278	6.631	-6.965	-0.051	0.960
	Extension	-4.083	1.381	-1.218	-6.948	-2.956	0.007*
QoL	3.667	4.406	13.804	-5.471	0.832	0.414	
6MW test	53.707	30.082	116.094	-8.679	1.785	0.088	
Hip external rotator	1.351	0.641	2.682	0.021	2.107	0.047*	
Hip abductor	0.904	0.724	2.407	-0.598	1.248	0.225	

thigh muscles in addition to the conventional treatment for this population. According to the present research results, both treatment approaches were effective on patients with unilateral total knee arthroplasty. Considering the better result of some of the outcome measures in the intervention group, the addition of hip strengthening exercises to knee exercises can be useful.

Acknowledgements

We want to thank the Vice-Chancellor for Research and Technology of Iran University of Medical Sciences for their help.

Ethical Considerations

Compliance with ethical guidelines

This research was approved by the Research Ethics Committee of Iran University of Medical Sciences (IR.IUMS.REC.1396.9511340012) and it was registered in the Clinical Trial Registration Center (Code: IRCT 20150314021459N6).

Funding

The paper was extracted from the MA. thesis of the first author, Department of Physiotherapy, School of Rehabilitation Sciences, Iran University of Medical Sciences, Tehran.

Authors' contributions

All authors met the standard criteria for writing based on the recommendations of the [International Committee of Publishers of Medical Journals \(ICMJE\)](#).

Conflicts of interest

The authors declared no conflicts of interest.