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Effectiveness of Group Based Exercises in Improvement of Pain and Functional Ability after Total Knee Arthroplasty- A Randomized Controlled Trial

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ABSTRACT

Total knee arthroplasty is the gold standard treatment for end stage knee osteoarthritis (OA). A randomized controlled trial was carried out to investigate the group based exercise program after total knee arthroplasty. Sixty Subjects were selected from day 1 after total knee arthroplasty and age ranging between 50 and 65 years. Subjects were assigned in to Group-A (individualized based exercise group) or Group-B (group based exercise group) by using 1:1 ratio. All the patients received post operative ambulation and activities of daily living exercises programme. Exercises programme has been done for 20 minutes twice daily under the supervision of therapist from the day after surgery till the day before discharge.

Intra group comparison was done by using Paired t-test, the Mean ± SD of post treatment for Group-A is 5.38±1.11 and Group-B is 5.01±1.06 with p value < 0.001 for both groups confirms that there is significant reduction of pain in both groups after intervention. The post treatment comparison between groups by independent t-test with t=1.31 and p=0.19 proves no significant difference between groups after intervention.

Results of this study shows there was not any significant difference in group based exercises and individualized exercise in reduction of pain and improving functional ability after total knee arthroplasty.

Key words: total knee arthroplasty, TKR, group based exercises, functional ability, osteoarthritis (OA).

INTRODUCTION

Total knee arthroplasty is the gold standard treatment for end stage knee osteoarthritis (OA) and the annual worldwide incidence of total knee arthroplasty has steadily increased over the past decade. [1,2,3] Total knee arthroplasty reliably reduces the pain associated with end stage knee OA and 90% of patients report reduced pain, improved functional ability, and greater health related quality of life after surgery. Moreover, 85% of patients who undergo total knee arthroplasty report being satisfied with the outcomes. [4]

The number of total knee arthroplasty surgeries performed each year is predicted to steadily increase. Following total knee arthroplasty surgery self-reported pain and function improve, though individuals are often plagued with quadriceps muscle impairments and functional limitations. Postoperative rehabilitation approaches either are not incorporated or incompletely address the muscular and functional deficits that persist following surgery. While the reason for quadriceps weakness is not well understood in this patient population, it has been suggested that a combination of muscle atrophy and neuromuscular activation deficits contribute to residual strength impairments. Failure to adequately address the chronic muscle impairments has the potential to limit the long-term functional gains that may be possible following total knee arthroplasty. Postoperative

rehabilitation addressing quadriceps strength should mitigate these impairments and ultimately result in improved functional outcomes. [5]

Physiotherapy after total knee arthroplasty includes use of modalities to reduce pain and edema, specific exercises to enhance joint range of motion, exercises to improve muscle strength and endurance, and transfer and gait retraining that enhance physical function and quality of life. [6, 7] In 2003, the National Institute of Health convened a consensus development conference to compile the scientific evidence surrounding total knee arthroplasty to enhance guidelines for clinical decision making and patient clinical outcomes. [4] Group based exercises can also provide therapy for several patients simultaneously and offers advantages such as cost effectiveness and positive impact on physical function of community dwelling elderly patients and also individual with severe OA. [8,9]

Total knee arthroplasty is common procedure in last decade. [2,3] In recent years early hospital discharge has been increased. Although the shorter hospital stay may limit the opportunities for post operative rehabilitation. Though the early post operative rehabilitation programme is a well accepted concept for increasing ROM and strength from knee arthroplasty, [10] the benefits of group based exercises in acute case after total knee arthroplasty remain unclear.

MATERIALS AND METHODS

A randomized controlled trial was carried out to see the group based exercise program after total knee arthroplasty. Ethical clearance was obtained from institutional review board. A convenient sample was adopted to select 60 subjects from body line hospital, Ahmadabad, Gujarat. Subjects were selected from day 1 after total knee arthroplasty and age ranging between 50 and 65 years. Both sexes were included in the study after obtaining informed consent. Subjects with uncontrolled hypertension or diabetes, neurologic impairments, co-existing osteoarthritis or any orthopedics conditions in contra lateral hip or knee. Subjects were assigned in to Group-A (individualized based exercise group) or Group-B (group based exercise group) by using 1:1 ratio. The subjects of both groups were explained about the importance of exercise. All the patients received post operative ambulation and activities of daily living exercises programme. Exercises programme has been done for 20 minutes twice daily under the supervision of therapist from the day after surgery till the day before discharge. For both the groups the goal was to discharge patient independent with cane. In addition to ambulation and ADLs patients in group based exercises group were participated in group exercises programme under the supervision of therapist. It includes ice massage of 15 min, 15 repetitions of ankle pumping, active heel slide and quadriceps strengthening exercises. [10] The other group has performed the same exercise individually under the supervision of therapist. It includes age, sex, knee pain and functional ability. Knee pain was measured by VAS [11] and functional ability was measured by KOS. [12] Data were collected on day of surgery and on the day of discharge.

RESULT

The data collected were analyzed for demographic variables and significance by using SPSS-17 for windows. All the statistical testing was performed at.05 level of significance. Significance was tested by independent t-test & paired t-test for VAS and Mann Whitney U-test & Wilcoxon Signed Rank test for KOS. Inter group comparison at baseline was done by independent t-test for VAS.

The Mean ± SD for Group-A is 6.60±1.16 and Group-B is 6.28±1.07 with p=0.26 proves homogeneity of both groups before intervention. Intra group comparison was done by using Paired t-test, the Mean ± SD of post treatment for Group-A is

5.38±1.11 and Group-B is 5.01±1.06 with p value < 0.001 for both groups confirms that there is significant reduction of pain in both groups after intervention. The post treatment comparison between groups by independent t-test with t=1.31 and p=0.19 proves no significant difference between groups after intervention.

	VAS						
	Group	Minimum	Maximum	Mean	SD	t value	p value
Pre treatment	A	4.20	8.80	6.603	1.115		
	B	4.60	8.70	6.276	1.074	1.13	0.26
Post treatment	A	3.20	7.50	5.38	1.111	1.31	0.19
	B	3.00	7.20	5.00	1.074		

KOS at baseline was compared by Mann Whitney U test for homogeneity shown in table-5. The median for Group-A is 50 and group-B is 52.5 before intervention in KOS with p=0.569 and z=0.570 proves the pre treatment homogeneity of both the groups. Post treatment comparison between groups by Mann Whitney U-test with z= 0.185 and p=0.853 proves no significant difference between groups after intervention.

	KOS				z value	p value
	Group	Minimum	Maximum	Median		
Pre treatment	A	40.00	62.00	50		
	B	39.00	68.00	52.5	0.570	0.569
Post treatment	A	52.00	76.00	66.00	0.185	0.853
	B	52.00	75.00	65.00		

Intra group comparison was done by Wilcoxon Signed Rank test for both groups with p value is <0.001 indicating a statistically significant reduction in pain and improvement of functional ability.

	VAS						
Groups		Minimum	Maximum	Mean	SD	t value	p value
A	Pre treatment	4.20	8.80	6.603	1.155		
	Post treatment	3.20	7.50	5.383	1.111	14.88	0.000
B	Pre treatment	4.60	8.70	6.276	1.074	15.08	0.000
	Post treatment	3.00	7.20	5.006	1.110		

	KOS				z value	p value
Groups		Minimum	Maximum	Median		
A	Pre treatment	40.00	62.00	50		
	Post treatment	52.00	76.00	66	4.791	0.000
B	Pre treatment	39.00	68.00	52.5	4.793	0.000
	Post treatment	52.00	75.00	65		

DISCUSSION

Total knee arthroplasty is highly prevalent surgery. Total knee arthroplasty decreases pain in most patients, but do not resolve many of the substantial functional limitation. Exercise programs could improve these limitations if implemented at an early stage. Yet, there is not enough information to guide which type of exercise works best for which patients at post operative total knee arthroplasty. This study will provide evidence to inform the choice of exercise programs at the early stages after surgery to increase the benefits of different exercises. It is also unknown which patients benefit from exercise at a early stage and this study will identify predictors of functional recovery and determine which treatment works best for outcomes relevant to patients.

This study was done on 60 elder subjects underwent total knee arthroplasty. Both the groups received same exercises under the supervision of therapist. One group has done exercise in group and other group has done individually. Pain and functional ability has been taken as an outcome measure. Both the group has been

evaluated on the day of surgery and on the day of discharge.

According to the results of this study scores of outcome measures have shown reduction in pain and improvement of functional ability in both the groups ($p<0.001$) after total knee arthroplasty at the day of discharge. Moreover there was not any significant difference in between Group A and Group B at the day of discharge. Results of this study shows there was not any significant difference in group based exercises and individualized exercise in reduction of pain and improving functional ability after total knee arthroplasty.

Some previous study regarding group based exercise in total knee arthroplasty showed no difference between groups based and individualized exercise group, [8] where as few studies shows better result with group based exercises compare to individualized exercises. [10,13,14] The study that showed positive effect of group based exercises that may be due to exercises has been given in very early stage and also in elderly population motivation has a great impact on efforts during exercises. However length of intervention for our study was short. Group based exercises can allow patients to compare their progress with others which offers interaction between patients who have same experience where as in individualized exercise assist in adherence, empowerment, and self efficacy. [15]

There are limitations of the study which should be interpreted during this. Pre operative factors have been measured during the study which may have impact on recovery phase after total knee arthroplasty. This design may lead to bias in selection or information regarding the exercises. We have not evaluated the psychological status of subjects which may have major role in group based exercises. [10] More often we have not included the surgical approach used for the arthroplasty. We also have not mentioned the medications given to the patients in post operative period which may affect the recovery after total knee arthroplasty. Further studies can be done with inclusion of all these limitations.

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