OPEN ACCESS

ORIGINAL ARTICLE

Effect of Dynamic Strength Training on Functional Independence of Female Rheumatoid Arthritis Patients

Sara Khawar Butt[1], Farah Shaheen[2]

1. Physiotherapist, Shalamar Hospital, Lahore
2. Head of Department, Physiotherapy Department Shalamar Hospital, Lahore

Keywords

Rheumatoid arthritis, dynamic strength training, functional independence

Author's Contribution

[1]Data analysis, Conception, Synthesis Discussion, Synthesis
[2]Planning of research, Interpretation writing, Interpretation

Article Info.

Received Date: Nov 09th, 2018
Accepted: June 18th, 2019

Conflict of Interest: Nil

Funding Sources: Nil

Address of Correspondence

Farah Shaheen
farahzahid2008@hotmail.com

Cite this article as: Butt SK, Shaheen F. Effect of Dynamic Strength Training on Functional Independence of Female Rheumatoid Arthritis Patients. JRCRS. 2019; 7(1):12-16. doi: 10.5455/JRCRS.2019070104

A B S T R A C T

Background: Synovitis is a persistent feature of rheumatoid arthritis and results in joint swelling and limited ROM, persistent joint swelling results in stretched tendons, joint capsules, and ligaments. Which ultimately leads to instable joint, decrease in muscle strength and muscle mass.

Objective: The main objective of the study was to determine the effects of dynamic strength training on functional independence of female rheumatoid arthritis patients

Methodology: A single blinded randomized controlled intervention study was conducted at Combined Military Hospital Lahore. Fifty female patients between age 40–60 years who had Rheumatoid arthritis for at least six months were recruited for the study. A guided activity with comprehensively designed sessions along set frequency was given to both groups. Both pre-treatment and post treatment functional independence were measured after 12 weeks of intervention by Functional Status Index.

Results: Paired t-test was applied for analysis within the same group and independent T- test was applied to compare outcomes of both control and experimental group. There was significant difference in independent functional status after treatment in Group A. Pain and Disease activity was markedly reduced in Group A. Patients showed improvement in overall muscular strength.

Conclusion: Dynamic strength training is an effective mode of treatment in improving functional independence of female rheumatoid arthritis patients without stressing joints.

Introduction

Synovitis is a persistent feature of rheumatoid arthritis and results in joint swelling and limited ROM, persistent joint swelling results in stretched tendons, joint capsules, and ligaments. Which ultimately leads to instable joint, decrease in muscle strength and muscle mass. [1]

The pathological changes are not confined to joints. The affected tendons usually become softened and rupture, and aggravate existing deformity. Inflammatory nodules are formed in the soft tissue. Within months or years, depending on disease activity, joints are permanently damaged, and result in joint deformity, instability, or ankylosis. Further, effusion in joint restricts contraction of surrounding muscle groups, and the peak contractile force of the muscle will not be attained if a joint is misaligned. Further, the compromised joint and the tissues surrounding result in impaired loading response, energy insufficiency, pain and further limited physical activities.[2] The duration of disease, limited or complete physical inactivity, functional impairment, and itself, the inflammatory process, contributes loss in bone density in diseases like RA. Persistent use of corticosteroids enhances muscle atrophy and decreases bone mineral density. This vicious cycle that results in loss of muscle strength, bone mineral density, and limited functional capacity finally results in generalized fatigue and limited physical activity.[3]

The muscle strength loss and functional impairment with enhancing bone loss develops early in

the course of RA. Many clinical studies measuring the effects of dynamic strength training exercise programs on healthy subjects have been described. Some studies show that how these exercises lead to maintenance or improvement in muscle strength, while reporting positive results.[4] The earlier studies indicate that dynamic strength exercises work as a stimulus to high strain rates and peaked forces in dynamic movements. Although, Dynamic strength exercises are reported as a significant method of reducing pain, joint stiffness and functional independence in RA patients, there is definitely a need for an additional study to determine the functional independence and an improvement in daily activities after various types of exercise training programs in RA patients.[5]

Methodology

All patients presented to the outpatient clinic of the Department of Physical Therapy and Rehabilitation of Combined Military Hospital Lahore between April 2013 and October 2013.

Almost 52 patients of chronic rheumatoid arthritis were recruited in single blinded randomized controlled trail and two of participants withdrew the study. A written consent was taken. All the patients were initially assessed by physical therapist for musculoskeletal problems. 50 Patients were allocated in two groups through randomized systemic sampling technique. The pre and post intervention measurements were recorded after 12 weeks. Female patients between age 40-60 years on DMARDS treatment for six months, falling in C-II and C-III ACR criteria were included. [6] Dynamic strength regimen and controlled regimen consisted as followed; both groups were given combined regimen of exercise and modality treatment including Infrared Rays 10 minutes, TENS on affected muscle groups for 15 minutes gentle stretching and isometrics for hands and feet performed thrice a week for each 5-10 repetitions. The patients in the Dynamic exercise group were underwent following treatment, leg press, step ups, squats, forward and lateral lunges , side shuffles, hand squeezing with Physio ball and isokinetic exercise ring, Thera band hand exerciser, free weights and pulley system thrice a week for 12-week. [7]

Following scales were used to assess functional independence, pain and disease progression including FSI, DAS, VAS and MRC.[8] After baseline assessment patients were reassessed at 12weeks. Paired t-test was applied for analysis within the same group and independent T- test was applied to compare outcomes of both control and experimental group. The data was analyzed through SPSS version 16. The continuous variables were expressed as mean ± S.D. whereas the categorical variables were expressed in frequency tables and percentages. The histogram was used to measure the normality of quantitative data. Paired-test was applied to determine any association between variables. A p-value less than 0.05 were taken as significant. [7]

Results

Female rheumatoid arthritis patients subjected to dynamic strength training showed significant improvement in their independent functional status before treatment functional status index in both groups was statistically same. (Group-A=182.60± vs. Group-B=183.28±4.15) (P-value=0.522). After 12 weeks treatment mean functional status index in Group-A and in Group-B was 95.08±3.13 and 161.12±5.30 respectively. According to p-value mean functional status index was statistically different in both groups. i.e. (p-value=0.000)

Table I: Descriptive Statistics for Height, Weight & BMI of Patients

		Group-A				Group-B		
		25				25		
	Age	Height	Weight	BMI	Age	Height	Weight	BMI
Mean	49.92	5.14	64.28	26.39	53.68	5.26	68.16	27.26
SD	5.98	0.15	3.65	1.130	4.52	0.16	4.87	1.75
Min	40	5.00	58.00	25.00	45	5.00	58.00	23.40
Max	60	5.60	70.00	28.80	60	5.80	80.00	30.60

Group-A= Experimental Group
Group-B= Control Group

Functional status index was much lower in Group-A as compared to Group-B.

In Group-A mean age of patients was 49.92±5.98 years and in Group-B mean age of patients was 53.68±4.52 years respectively. Age range of patients in both groups was 40-60 years. Mean height, weight and body mass index of patients in Group-A was 5.14±0.15 meter, 64.28±3.65 Kg and 26.39±1.13 Kg/m2. In Group-B mean height, weight and body mass index was 5.26±0.16 meter, 68.16±4.87 Kg and 27.26±1.75 Kg/m2.

In Group-A, 7 patients had sudden and 18 patients had progressive onset of Rheumatoid Arthritis. While in Group-B 9 patients had sudden and 16 patients had progressive onset of Rheumatoid Arthritis. In Group-A 15 patients had family history Rheumatoid Arthritis while in Group-B 17 patients had family history of Rheumatoid Arthritis.

Among these 50 patients 13 patients (Group-A=7(28%), Group-B=6(24%)) RA factor was positive. Mean duration of morning stiffness reported by Group-A patients was 2.14±0.72 hours and in Group-B mean duration of morning stiffness was 1.82±0.59 hours respectively. In Group-A 6(24%) patients had subcutaneous nodules and in Group-B 5(20%) patients had subcutaneous nodules. Mean ESR level in Group-A patients was 41.28±17.34 and in Group-B mean ESR level was 32.60±13.70. In Group-A ESR range was 15-90 and in Group-B ESR range was 15-56.

Mean Anti CCP in Group-A patients was 1.84±0.37 and in Group-B Anti CCP level was 1.84±0.37. In both treatment group's range of Anti CCP was 1-2.

Disease activity score before treatment in Group-A and B was 4.60±0.82 and 4.69±0.78. Mean disease activity score was statistically same in both treatment groups before treatment. After 12 week treatment disease activity score was again assessed in both treatment groups. At this point mean disease activity score was less in Group-A as compared to Group-B. i.e. (Group- A=3.97±0.46 vs. Group-B=4.77±0.69). (P-value=0.000).

Before treatment means MRC grading was statistically same in both treatment groups. (Group-A=2.60±0.22 vs. Group-B=2.65±0.23, p-value=0.502) While after 12 weeks treatment mean MRC grading was high (showing improvement) in Group-A as compared to Group-B. (Group- A=3.56±0.26 vs. Group-B=2.92±0.14, p-value=0.00

Before treatment functional status index in both groups was statistically same. (Group- A=182.60± vs. Group-B=183.28±4.15) (P-value=0.522). After 12 weeks treatment mean functional status index in

Table II: Paired t-test for comparison of improvement within groups

Groups			Mean ± S.D	Paired differences Mean ± S.D	p-value
Group A	**NPRS**	**Pre-Treatment**	6.68 ± 1.02	1.53 1.02	0.001
		Post-Treatment	5.14 ± 1.34		
	DAS	**Pre-Treatment**	4.60± 0.82	0.63 0.71	0.001
		Post-Treatment	3.97± 0.46		
	MRC	**Pre-Treatment**	2.60 ± 0.22	-0.96 0.30	0.001
		Post-Treatment	3.60 ± 0.26		
	FSI	**Pre-Treatment**	182.6± 3.24	87.52 4.13	0.001
		Post-Treatment	95.08± 3.13		
GROUP B	**NPRS**	**Pre-Treatment**	6.66± 0.77	0.66 0.14	0.004
		Post-Treatment	5.99± 0.82		
	DAS	**Pre-Treatment**	4.69± 0.78	-0.08 0.42	0.338
		Post-Treatment	4.77 ±0.69		
	MRC	**Pre-Treatment**	2.65± 0.23	-0.27 0.21	0.034
		Post-Treatment	2.92 ±0.14		
	FSI	**Pre-Treatment**	183.2± 4.1	22.16 6.3	0.001
		Post-Treatment	161.1± 5.3		

Dynamic strength training shows significant results within Group A than Group B.

e-ISSN: 2410-888X p-ISSN: 2226-9215

Table III: Shows comparison between two groups. Independent t test was applied

	Group A (n=25) Mean ±S.D	Group B (n=25) Mean ± S.D	P-Value
FSI Pre Treatment	182.60±3.24	183.28±4.15	0.522
FSI Post Treatment 12 Weeks	95.08±3.13	121.12±3.19	0.001
DAS Pre Treatment	4.60±0.82	4.69±0.78	0.701
DAS Post Treatment 12 weeks	3.97±0.46	4.77±0.69	0.001
MRC Pre Treatment	2.60±0.22	2.65±0.23	0.502
MRC Post Treatment 12 weeks	3.56±0.26	2.92±0.14	0.001

Group-A and in Group-B was 95.08±3.13 and 161.12±5.30 respectively. According to p-value mean functional status index was statistically different in both groups. i.e. (p-value=0.000) Functional status index was much lower in Group-A as compared to Group-B.

Discussion

The purpose of the study was to analyze the effect of physical therapy training with and without dynamic strength training in 40-60 year female patients with rheumatoid arthritis. For this purpose 50 female patients were conducted to study .Systematic sampling (a type of random sampling) was used in which all odd ordered patients (1st, 3rd, 5th, 7th, etc.) was included in group I and all even ordered patients (2nd, 4th, 6th, 8th, etc.) were included in group II. Group I was subjected to experiment with dynamic strength training for 12 weeks. Before the start of session, All the subjects were assessed for their age, height, weight, BMI, DAS SCORE), duration of stiffness, onset, and intensity of pain VAS and demographic characteristics, functional status FSI, MRC muscle power . Body mass index of patients in Group-A was and 26.39±1.13 Kg/m². In Group-B body mass index was and 27.26±1.75Kg/m². In Group-A 15 patients had family history Rheumatoid Arthritis while in Group-B 17 patients had family history of Rheumatoid Arthritis. Among these 50 patients 13 patients (Group-A=7(28%), Group-B=6(24%)) RA factor was positive All of the patients were reassessed for, DAS SCORE), duration of stiffness, onset, and intensity of pain VAS , functional status FSI, MRC muscle power, after a 12 week exercise session.[9]

Our results revealed a significant decrease in functional status index [FSI] in experimental group compared to control group. Also DAS SCORE 28 showed a little more significant result in experimental group as we observed and recorded low disease activity after completion of 12 week exercise session.[10] Muscle power was assessed using MRS scale which was also much improved in experimental group.[11]

This study results apply on limited group of people affected with rheumatoid arthritis, as severely affected joints or grade 4 RA patients were not subjected to study.

Conclusion

Dynamic Strength Training is an effective mode of improving functional independence of female patients with RA without damaging joint or aggravating disease activity.

References

1. Luyten FP, Lories RJ, Verschueren P, de Vlam K, Westhovens R. Contemporary concepts of inflammation, damage and repair in rheumatic diseases. Best Practice & Research Clinical Rheumatology. 2006;20(5):829-848.
2. Derouin A. Muscle contributions to knee joint stability: Effects of ACL injury and knee brace use. 2006.
3. Häkkinen A, Sokka T, Kotaniemi A, Hannonen P. A randomized two-year study of the effects of dynamic strength training on muscle strength, disease activity, functional capacity, and bone mineral density in early rheumatoid arthritis. Arthritis & Rheumatism. 2001;44(3):515-522.
4. Geusens P, De Nijs R, Lems W, Laan R, Struijs A, Van Staa T, et al. Prevention of glucocorticoid osteoporosis: a consensus document of the Dutch Society for Rheumatology. Annals of the rheumatic diseases. 2004;63(3):324-5.
5. Stenström CH, Minor MA. Evidence for the benefit of aerobic and strengthening exercise in rheumatoid arthritis. Arthritis Care & Research. 2003;49(3):428-434.
6. Martin DP, Sletten CD, Williams BA, Berger IH, editors. Improvement in fibromyalgia symptoms with acupuncture: results of a randomized controlled trial. Mayo Clinic Proceedings; 2006: Elsevier.
7. Hegmann KT, Biggs JJ, Hughes MA, Lichtblau E, Coward DB, Iorio CD, et al. Knee disorders. Occupational medicine practice guidelines Evaluation and management of

common health problems and functional recovery in workers 3rd ed Elk Grove Village (IL): American College of Occupational and Environmental Medicine (ACOEM). 2011:1-503.
8. Fries JF, Hochberg MC, Medsger Jr TA, Hunder GG, Bombardier C, DIAGNOSTIC ACO, et al. Criteria for rheumatic disease. Different types and different functions. Arthritis & Rheumatism. 1994;37(4):454-462.
9. Luttrell T. Effect of obesity on chronic wound healing: University of Colorado at Denver; 2011.
10. Aletaha D, Neogi T, Silman AJ, Funovits J, Felson DT, Bingham III CO, et al. 2010 rheumatoid arthritis classification criteria: an American College of Rheumatology/European League Against Rheumatism collaborative initiative. Arthritis & Rheumatism. 2010;62(9):2569-2581.
11. Haringman JJ, Kraan M, Smeets T, Zwinderman K, Tak P. Chemokine blockade and chronic inflammatory disease: proof of concept in patients with rheumatoid arthritis. Annals of the rheumatic diseases. 2003;62(8):715-721.

e-ISSN: 2410-888X p-ISSN: 2226-9215