

Grip Strength and Hand Function in Rheumatoid Arthritis Patients using Polypellets and Home Exercise Program: A Quasi-Experimental Study

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ABSTRACT

Background: Exercises with polypellets and Home Strengthening Exercises for hand in Rheumatoid Arthritis, it is a condition which most effects in smaller joints when compared to other parts of the body.

Objective: To determine grip strength and hand function in rheumatoid arthritis patients using polypellets and a home exercise program.

Methodology: It is a quasi-experimental design, pre-test and post-test type, and study duration of four weeks. Both men and women aged 20-40 years, diagnosed cases of rheumatoid arthritis with less hand grip strength and VAS of 4-9 and swelling in hand were included. The subjects were administered with polypellets and home exercise programme and assessed with the visual analogue scale, Michigan hand questionnaire, and hand grip strength, before and after 4 weeks of intervention.

Results: The result shows that there is significance between pre-test and posttest of VAS right and left is .001, Michigan hand questionnaire is .146 and hand grip strength is .034 for right and .031 for left.

Conclusion: The study concludes that there is an effect of polypellets and home exercise programme on grip strength and hand function in patients with rheumatoid arthritis.

Keywords: Hand dynamometer; Hand grip strength; Polypellets, Physical therapy; Rheumatoid arthritis

INTRODUCTION

Rheumatoid arthritis is an auto-immune disease that is characterized by inflammation of the joints and subsequent destruction of cartilage and erosion of bones. The cause of rheumatoid arthritis is not known, it may cause due to genetic and disease primarily effecting the synovial membrane in joints and tendon sheets and changes to rheumatoid synovitis, it increases the inflammation, oedema in synovial tissues, the joint spacing will be become more due to more production of synovial fluid. The normal fibres present in the joint will be affected by the diseased synovial in the surrounding tendons and due to tendon stretching the hand strength will be decreased and gradually it ruptures [1]. Rheumatoid Arthritis (RA) affects approximately 0.5%-1% of the adult population in the world, with an estimated annual incidence of 12.0-24.5 males and 23.9-54.0 females per 1 lakh people. Indian people are more affected with rheumatoid arthritis than the other countries in the world. Which is more than 0.92% of the adult population [2,3].

Rheumatoid arthritis is more common in adult age and nearly 80%-90% of RA patients will be affected mostly in small joints such hand and wrist region, having symptoms such as morning stiffness, pain, swelling, stiffness in the carpal and metacarpal joints and later progressively hand deformities develops which affects the patients activities of daily [4-6]. The progression of disease leads to various deformities, namely, intrinsic plus deformity, swan neck deformity, Boutonniere deformity, ulnar

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deviation, the future loss of function in joints reducing hand movements and grip strength [7-9].

Medications improve hand function and help in controlling deformities in the hand, but there is no evident that medications will affect on improving muscle bulk, or in preventing muscle wasting in palm of the hand. The exercises with polypellets and strengthening, resistance exercises help to increase the hand function [10-12].

Polypellets are desensitization particles, helps to maintain range of motion, helps with pain, and increases the superficial sensory and increases circulation (due to pumping action). The strengthening exercises also help to increase the function of the hand and maintain the range of motion, the patient have to continue their exercises at home. The resistance exercises will mostly help to increases there range of motion, by performing the exercises they will help to maintain proper hand function and prevent the deformities of the hand [13-14].

METHODOLOGY

Inclusion criteria

Age group ranging from 20-40 years. Diagnosed case of rheumatoid arthritis. Patients who are having less hand grip strength.

Men

<37.7 kg.

Female

<25.6 kg.

Visual analogue scale [4-9]. Patient who is having swelling and pain in the Proximal Inter Phalangeal (PIP), Distal Inter Phalangeal (DIP) and Metacarpophalangeal (MCP) joints of the hands.

Exclusion criteria

Nerve injury and nerve palsy. Deformities of hand. History of Fracture. Patients who are not willing to participate in these studies.

Material used

Hand dynamometer and polypellets.

Outcome measures

Visual analogue scale, Michigan hand questionnaire, Hand grip strength.

Procedure

The subjects (n=8) were selected according to the inclusion and exclusion criteria, participants are provided with written informed consent for their participation in the study and the patients to be explained about the study as well as the exercise protocol. The subjects were assessed to determine their hand function. The pain level was evaluated by visual analogue scale, functional activity was assessed with Michigan Hand Outcome Questionnaire and the subjects grip strength was assessed using Hand dynamometer.

Michigan hand questionnaire contains different components such as overall hand function, activities of daily living, work performance, pain, aesthetics and satisfaction with hand function. All these components are used to assess the hand function.

To evaluate the hand grip strength, the subject is asked to sit in the erect position without back support, then instructed to hold the hand dynamometer with their arm at the 90 degree angle and elbow placed on side of the body, then the subject is asked to squeeze the dynamometer as hard as they can do it and they have to squeeze and hold for 5 seconds.

The participants were treated with polypellets for 3 session per week, followed by home exercises programme (tendon gliding; radial walking; intrinsic flexion; finger-extension, abduction; thumb-flexion, extension, adduction, abduction; gross grip; finger pinch grip; fan and fist) the subject have to repeat each exercises 8-10 repetitions, 3 sets per day. These exercises programme is given for 4 weeks, after 4 weeks of the exercise programme again the subject have been assessed for post-test.

The subjects are advised to continue their exercise regularly. The subject while treating with polypellets are instructed to sit in relaxed position by arm and forearm in extension position and instructed to hold the polypellets and leave, which will help to produce flexion and extension movements in their fingers and hand.

Data analysis

The collected data was tabulated and analyzed by using IBM SPSS version 20.0 software. To assess all parameters mean were used, paired t test was applied to compare the pre-test and post-test values of visual analogue scale, Michigan hand questionnaire and hand grip strength.

The table shows that the mean of visual analogue scale on right side and left was6.87 which was decreased to mean of 5.43 and the mean of grip strength on right side was 2.11 was increased to mean of 2.56; left was 1.80 was increased to 2.18. The significant value between pre-test and post-test of visual analogue scale p<0.005 (right .001; left .001) and grip strength p<0.005 (right .034; left .031). As the whole table infers that visual analogue scale and grip strength has been improved their hand grip strength, and decreased the pain level.

The table shows the mean value of Michigan hand questionnaire was 3.62 and it was Decreased to 1.75 and there is significant value between pre-test and post-test of Michigan hand questionnaire at p<0.005 (.014).

RESULTS AND DISCUSSION

Results were analyzed by using IBM SPSS Version 20.0 software (Tables 1 and 2).

Rheumatoid arthritis affects at any age group people, due to the rheumatoid swelling, and morning stiffness. There are number of studies on rheumatoid arthritis the people have been mostly affected in their hand, so they are having difficulty in there functional actives and commonly they are having Pain. The people with rheumatoid arthritis are mostly affected due to synovial inflammation present in the tendon and damage the tendon structure which increases the stiffness in the joint, but ligaments present in the joint help to maintain the function, so by strengthening exercise it will maintain the function of joint stabilize passively and help to guide the joint for normal range of motion. Active exercises which helps for tendon gliding and contractions of muscles can act as the pump, it will help for flow of edema away from the periphery [7]. Table 1: Pre and Post-test values of visual analogue scale and hand grip strength. The table shows that the mean of visual analogue scale on right side and left was6.87 which was decreased to mean of 5.43 and the mean of grip strength on right side was 2.11 was increased to mean of 2.56; left was 1.80 was increased to 2.18. The significant value between pre-test and post-test of visual analogue scale p<0.005 (right .001; left .001) and grip strength p<0.005 (right .034; left .031). As the whole table infers that visual analogue scale and grip strength has been improved their hand grip strength, and decreased the pain level (Note: *P<0.005).

	Pre Test						Post Test				75%	75%	75%	75%
	Ν	Mean		S.D		Mean	S.D			df	T-test		Significance	
Visual analogue scale	8	RT	LT	RT	LT	RT	LT	RT	LT	7	RT	LT	RT	LT
		6.87	6.87	1.45	1.45	5.43	5.43	1.45	1.45		-5.57	-5.57	0.001	0.001
Grip Strength	8	2.11	1.8	1.34	1.36	2.56	2.18	1.49	1.6	7	-2.63	-2.68	0.034	0.031

Table 2: Pre and post-test values of Michigan hand questionnaire. The table shows the mean value of Michigan hand questionnaire was 3.62 and it was Decreased to 1.75 and there is significant value between pre-test and post-test of Michigan hand questionnaire at p<0.005 (.014) (Note: *P<0.005).

		Pre-	test	Post	-test				
Michighan	Ν	Mean	S.D	Mean	S.D	Df	Ttest	Significance	
hand questionnaire	8	3.62	1.5	1.75	1.03	7	3.23	0.014	

They are various types of studies done on hand exercise programme previously and they concluded that there is an increased hand function after the strengthening exercise programme [8-11].

The aim of the study was to find out the effectiveness of polypellets with home exercise programme on grip strength and hand function in patients with rheumatoid arthritis. In this study we have evaluated according to the outcome of a hand grip strength, Michigan hand questionnaire and visual analogue scale, the subjects are assessed before and after the exercises programme [12-14].

The polypellets are soft desensitization materials. The effect of polypellets are used in the study, provide the pain free movements in their hand help to increase circulation by producing the hand and finger movements and decreases the swelling in the joints. In this study totally 50 subjects were assessed, but according to the mentioned inclusion and exclusion criteria only 8 subjects were fit for this study. Other 20 patients, diagnosed with rheumatoid arthritis did not have any problem with hand functional activities and they did not have any swelling or pain in their carpal and metacarpal joints. The remaining 22 patients had Severe deformities in there hand for which reasons they were excluded from this study, so which was excluded from my study.

The 8 subjects treated with polypellets and hand strengthening exercises for four weeks we found to have significant changes before and after the exercise programme. The subjects also reported to have betterment in their pain levels, swelling and range of motion.

The result of this study shows that there is a significant difference present between pre-test and post-test of visual analogue scale, Michigan hand questionnaire and hand grip strength (p<0.05) indicating there is a decreased pain level, swelling in their hands and increased hand grip power.

This study says that the strength of the whole hand and the strength of each finger before and after rehabilitation shows statistically significant deficit of strength in RA patients (p<0.001)

and that study concluded that, rheumatoid arthritis contributed to the improvement of its function by pain reduction, improved value and quality of grip, and also increased manipulative ability.

This study says that there was a statistically significant present the mean value increases from before and after the exercise programme, who concluded and suggests there is a role for strengthening hand exercises in the management of RA. Hand function is of utmost importance to the RA patient and this study contributes to the existing evidence to guide the therapist in management programme.

CONCLUSION

This study says that there is statistically significance present after 3 weeks of study, patients also reported that they had more improvement in their hand function, who concluded the short term, physical and, particularly, exercise therapy produces a favorable improvement in the functional status of the rheumatoid hand.

This study concluded that after four weeks of the exercise with polypellets and home strengthening programme, there is significantly improved hand function, hand grip strength with decreased pain among adult rheumatoid arthritis patients.

LIMITATIONS

- Smaller sample size.
- Only adult (20-40) rheumatoid arthritis patients were selected.
- The training sessions were less per week.

RECOMMENDATIONS

- Long term effects are recommended.
- All age group people have to be diagnosed with rheumatoid arthritis was recommended in further studies.
- Resistance exercises (Theraband, putty) are recommended for the further studies.

- Gender has not been classified.
- The patients who having pain and swelling were only taken into the study.
- Only strengthening exercises are recommended.

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