

Comparison of physical therapy, massage therapy, mechanotherapy and compound programs on rotator cuff muscles in shoulder impingement syndrome patients

Alibakhshi E.* MSc, Golpayegani M.¹ PhD, Kazemipour M.² MSc, Mollanorouzi K.³ MSc, Parastesh M.¹ MSc

*Sport Physiology Research Center, Baqiyatallah University of Medical Science, Tehran, Iran;

¹Faculty of Physical Education, Arak University, Arak, Iran;

²Sport Physiology Research Center, Baqiyatallah University of Medical Science, Tehran, Iran;

³Department of Physical Education, Faculty of Physical Education, Eslamshahr Branch, Islamic Azad University, Eslamshahr, Iran

Abstract

Aims: The continuous use of hand over the head causes the pressure and load in the long run and disposes the shoulder impingement syndrome. The aim of this study was to investigate the effect of selected treatment methods in terms of the difference in improvement rate and duration of treatment on shoulder impingement syndrome of volleyball players and to provide an effective treatment protocol.

Methods: In this study 60 Volleyball players suffering from shoulder impingement syndrome, were selected and divided into four groups including physical therapy (17), massage therapy (15), mechanotherapy (14) and compound group (14). For continuing the treatment programs outside the clinic, the housing program and immune recommendations in work and sport environment were used. MRI or Magnetic resonance imaging, Special Clinical Tests, and the rotator cuff muscles EMG were used for evaluation of the 4 research programs. The correlated T-test was used for evaluation of programs in pretest and posttest, and the ANOVA test and the Turkey's post hoc test were used for determining a significant distance between groups in a level of $p < 0.05$.

Results: Compound program had more significant results. In none of range of motions of AB, FL, EX and IR the significant difference between the 4 physical therapy, massage therapy, mechanotherapy and compound program was observed, but compound program in ER movement was significantly more effective ($p < 0.011$). Supraspinatus muscle in compound program, then in physical therapy had the lower reaction time comparing to the other groups ($p < 0.037$). Teres minor was excluded from the measuring system due to its more depth and lower performance among the rotator cuff muscles.

Conclusion: Compound therapeutic program had the better therapeutic effects on the increasing of physical range of rotator cuff muscles especially the Supraspinatus muscle.

Keywords: Mechanotherapy, Physical Therapy, Massage Therapy, Rotator Cuff Muscles, Volleyball Player, Shoulder Impingement Syndrome

Introduction

The most frequent reason of shoulder chronic pain is the disorder that is caused by hard work. Shoulder impingement syndrome is the most frequent problem with a prevalence of 24-65% that can be observed in many overhead movements, exercises, or daily life and in many jobs [1, 2].

Shoulder impingement syndrome was first introduced by Neer, which remained the same name due to many shoulder problems in swimmers [3].

Rotator cuff muscles are among the most hard-working and basic muscles of shoulder joint muscles that face such problems. One can state that this complication is more frequent in middle age and old age. The prevalence of this damage is observed most in sports such as swimming, gymnastic, tennis, volleyball, ski, and wrestling [4]. The Maryland university's medical center has selectively mentioned to a variety of treatments to cure the shoulder

impingement syndrome in athletes, which includes the prescription of Non-steroidal anti-inflammatory drugs or (NSAIDS), oral and muscular corticosteroids, joint filtration through subacromial injection method, ice therapy in acute cases of injury, frictional and effleurage massage therapy, immobility of damaged organ, flexibility and strength exercises, motion therapy (including range of motion exercises and increase of athletes' performances, ultrasound (US), trans cutaneous electrical nerve stimulation (TENS). The aim of these prescriptions is reducing pain, returning the individual's normal range of motion and finally returning individual to the normal life [5].

Lintel et al have studied the aim of PNF exercises, heat, and cold therapies on flexibility of shoulder. Results indicate that the composition of flexibility exercises PNF and cold therapy cause more efficiency in increasing the flexibility during stretching [6]. In a research, Herbert used massage therapy in composition with motion therapy in individuals who

* Correspondence; Email: esmail.e79@gmail.com

suffered from severe shoulder inflammation. At the end of treatment, he achieved satisfactory results from the composition. According to Herbert, massage therapy acts as a supporter in motion therapy and special therapeutic exercises to control skeletal-muscle pains.

In this research, shoulder's range of motion in external rotation in post-test in comparison with the pre-test indicates a significant improvement and in EMG, the reaction time of supraspinatus muscle decreases that results in the improvement of patients after 6 weeks of therapy schedule [7].

Rapsil et al performed a standard and clinical protocol including radiologic and sonographic tests, anti-inflammatory steroids drugs, exercise therapy, ultrasound therapy and arthroscopic surgery on 41 patients suffering from chronic shoulder pain due to rotator cuff tendonitis (swimmers' shoulder syndrome) and biceps brachii. Results show that sonography is a highly accurate, safe, dynamic, and inexpensive detection device and conservative therapy that will result in improvement after 2 months [8].

In a research, San Bursa et al. categorize 30 patients in two 15-member groups of exercise therapy and compound therapy (therapy exercises in accompany with manual therapy) in order to compare the effectiveness of two treatment methods for shoulder impingement syndrome. The subjects of the exercise therapy performed reinforcement exercises, range of motion exercises, and stretching exercises of rotator cuff muscles, trapezius, and scapular rotator muscles, serratus anterior and tests of manual therapy group, dynamism techniques, massage, ice therapy and reinforcement and stretching exercise programs of the exercise therapy group for four weeks. The subjects of both groups showed significant decrease of pain and improvement of shoulder performance. However, the comparison of the compound therapy results with those of exercise-therapy showed a significant difference in favor of the compound-therapy group [9]. In another research, Cetola et al categorized 140 subjects suffering from shoulder syndrome in two 70-member groups of exercise therapy and acromioplasty to compare the effectiveness of two therapeutic methods of swimmers' shoulder impingement syndrome. Results show that the selected treatment for the patients who suffered from shoulder impingement syndrome is the conservative method (exercise-therapy) [10].

Yet in another research, in order to study the effect of motion therapy on the activities of rotator cuff muscles in shoulder external rotation in throwers with and without pain, Richardson et al achieved to a

significant decrease in the delay of first activity of subscapularis as a supporter in the motion of rotator cuff muscles. In this research, in the external rotation movement a high significant relationship was achieved after a period of exercise-therapy. In the EMG results the reaction time decreased especially in supraspinatus, subscapularis, and the external rotation will improve in supraspinatus as the performer and in subscapularis as supporter [11].

In a research under the title of studying the prevalence rate of shoulder injuries combined with pain in wheelchair users, Margaret Finley et al treated 26 male athletes and 26 male non-athletes under the special clinical program including motion therapy, manual therapy, and drug therapy. Measuring the range of motion with shoulder joint pain, 46% of symptoms, and clinical signs resulted from shoulder muscles tendonitis decreased significantly [12]. In another research under the title of studying, the disorders of shoulder rotator cuff and reviewing the related pathomechanisms used such systems as ultrasound, and TENS that resulted in good results in the improvement of patients. Also in some cases, the application of rhythmic stabilization exercises, PNF exercises, friction massage, and anti-inflammatory drugs seem affective [13]. The only common used treatment for this disorder in Iran is physiotherapy that may not satisfy the need of athletes [14]. On the other hand, the review of related literature indicates the variety of therapy protocols, for the treatment of shoulder impingement syndrome in athletes that in this respect the systematic analysis of an effective method therapy that help athletes to return the sport fields as soon as possible with complete improvement seems necessary. There are some issues on the reasons of disorders creation. Yet it is very important to return the athletes with complete preparation like the old days to the sport field. Of course, it is very important to mention to the fact that coaches do not pay attention to complete improvement of the athletes, and before preparing the athletes, coaches bring the athletes in to the practice. This is the major problem in many sport disorders. Among these disorders, the problems of shoulder region due to the lack of enough scientific sources and few researches, is regarded as the most important disorders according to the orthopedic specialists, regarding the lack of strength in this region and high-efficiency of this organ during the exercises [15].

The aim of the present research was to study the rate of treatment and preparation of volleyball players who suffered from shoulder impingement syndrome through common therapy methods in terms of

difference in improvement rate and the duration of treatment separately and to compare with the composition of these methods and to present an effective protocol.

Methods

In this semi-experimental research after medical-sport, filing, and obtaining consent, 60 male volleyball players who had referred to the medical clinic and sport centers of Arak in nine months during May 2006 to January 2006 were selected purposefully. Moreover, the samples were categorized in 4 groups of mechanotherapy (14 people), massage therapy (15 people), motion therapy (17 people), and compound therapeutic program (14 people). Two subjects resigned during the experimental plan because of decreasing the signs of discomfort and non-cooperation.

Massage-therapy program: regarding the level of pain and motion limitation of subjects, techniques of table 1 was used. Karoline used this program for the shoulder impingement therapy [7, 16].

Row	Method	The way of performance
1	Surface caress	Stroking and surface massage by all hand
2	Circular	Circular movements of four fingers and thumb
3	Fingertip	Circular movements of hand fingers on the single point
4	With thumb help	Pushing and circular movements by fingers
5	Rubbing	Pushing and circular movements by thumb
6	Calm touch	Circulation with the hand's interior heel

Row	Method	The way of performance
1	Isometric	Active isometric exercises without exerting the active resistance
2	Motion range	Motor range's exercises as active up to the pain threshold
3	Resistive isometric	Active isometric exercises with exerting the small resistance
4	Low-resistance	Isotonic active isometric exercises in the maximum motor range with gradual resistance
5	Flexibility	Flexibility exercises in the maximum motor range on agonist and antagonist muscles
6	Internal stimulations	Coordination and motor control exercises with the same skill
7	Load-increasing activation	Gradual increase in activity and load in the damaged muscle
8	Skill	Proficiency training exercise with the highest resistance in a special mode

Mechanotherapy program: the procedure of mechanotherapy program with mechanical machines or twosome resistively is shown in table 2. In order to treat the disorder of chronic pain of shoulder in motion therapy clinic of London University, Holliman et al have suggested that mechanotherapy is accompanied with good treatment effects in decreasing of symptoms, increasing of range of motion of shoulder, and improvement of nocturnal pains of patients [11].

Motion-therapy program: this program included treatment methods of Williams and PNF exercises (Table 3) that many researchers such as (Lintel, Taylor, Herbert, Margaret Finley, etc) used it [10].

Compound program: this program included the selection of three above-mentioned programs each of which performed for 20 minutes (Table 4). This program included the cases that many motion therapy and physical medicine specialists have suggested for the shoulder impingement syndrome.

Row	Method	The way of performance
1	Tensile (Static and dynamic)	Increasing the shoulder joint's range of motion
2	PNF stretching	Increasing the flexibility, control, coordination of the muscles
3	Isometric	Improved in three static strength of shoulder muscle
4	Eccentric	Improve muscle strength in all motor aspects of shoulder's muscles
5	Mechanotherapy	Increased power and performance using exercises
6	Skill	Improved proficiency and advanced performance in shoulder joint

Program	Executive row of tables 1, 2 and 3
Massage Therapy	1, 2, 5 and 6
Mechanotherapy	1, 2, 4 and 8
Mechanotherapy	1, 2, 3 and 6

To control and continue the treatment programs, all the subjects were asked to perform the indoor treatment program particular for research groups and home safety advices, work and sport place. Of course, the manner in which these programs were performed outside the clinical environment was not completely controlled. Moreover, the type of drugs that was possibly used to decrease the symptoms was not reported to the clinic.

The disorder rate was recognized and saved by using the clinical tests which are done by orthopedist and MRI (Magnetic Resonance Imaging) in the beginning

and at the end of the research. To assess the pretest, five painful range of motion including Flexion, Extension, Abduction, Internal rotation, and External rotation were measured by universal goniometer. Needle EMG testing was used in order to assess the rate of activity, power, and motion model of rotator cuff muscles, relative delay time, and the time of reaction in five range of motions. The data were saved in special and standard forms of tests analysis. The program included 12 one-hour sessions for four weeks, 3 sessions each week.

In order to analyze the data, descriptive and inferential statistics were used. In the beginning, in order to study the normal distribution of data, the Kolmogorov-Smirnov test was used, and then in order to study the significant difference of averages ANOVA and correlated T tests were used in each pre and posttests of every treatment program.

Results

The average age of all the subjects was 35.13 ± 2.8 ; the average height was 180.14 ± 2.12 cm; the average weight was 79.47 ± 1.8 kg; the average of injuries experience of shoulder was 6.2 ± 1.3 months; and the average of sport experience was 9.93 ± 1.2 .

The difference of achieved results of special clinical test in pre and posttests was meaningful in four groups ($p < 0.02$); but it shows a significant difference in the compound program ($p < 0.01$). Only in motion therapy program, unnatural results were observed in clinical tests because two of the subjects had severe inflammation in rotator cuff in addition to shoulder impingement syndrome (Table 5).

Table 5- Percentage of the normal results of the clinical tests in four test groups

Stage→ Test↓	Pretest				Posttest			
	C	P	Me	Ma	C	P	Me	Ma
Acromial tenderness	36	41	37	44	65	77	59	61
Painful range of motion	27	68	40	51	64	72	69	78
Joint emptiness	44	22	43	29	77	80	68	85
Resistance in external rotation	26	42	35	33	85	71	66	76
Resistance in abduction	33	52	41	34	80	79	68	76

C: Compound; P: Motion-therapy; Me: Mechanotherapy; Ma: Massage therapy

In the pretest of treatment programs, ANOVA test was done to par the range of motions of shoulder and three subjects were excluded. ANOVA test in the posttest of four treatment programs did not show any significant

difference in range of motions of AB, FL, EX, and, IR ($p < 0.088$; Table 6). However in ER motion the compound program showed a more significant difference ($p < 0.013$; $F = 10.365$; Table 7).

Table 6- The results of movements done based on degree in pretest and posttest in four test groups

Group→ Movement↓	Message therapy	Motion-therapy	Mechano-therapy	Compound	Level of significance	
Abduction	Pre	24.73	27.33	24.33	32	0.0211
	Pro	51.87	48.13	48.53	54.73	
Extension	Pre	17.33	16.13	14.33	16.53	0.0533
	Pro	26	26.33	23.47	26.8	
Flexion	Pre	58	59.67	49.47	64.53	0.0550
	Pro	111.53	122.27	111.53	129.6	
Internal rotation	Pre	3027	31.73	29.53	26.93	0.0331
	Pro	47.2	49.53	47.13	44.93	
External rotation	Pre	22.13	29.73	18.87	24.6	0.0143
	Pro	32.93	39.33	28.87	40.27	

Table 7- Statistical indicators of variance analysis (ANNOVA) of the 5 movements in the compound treatment program

Statistical indicators→ Movement↓	Degree of freedom	Sum of squares	Mean squares	F	level of significance	
Abduction	Intergroup	3	559.800	186.600	0.69	0.28
	Within-group	56	6517.6	116.386		
	Total	59	7077.4	-		
Extension	Intergroup	3	72.45	24.150	1.64	0.095
	Within-group	56	826.133	17.725		
	Total	59	898.583	-		
Flexion	Intergroup	3	1773.78	591.261	1.70	0.088
	Within-group	56	42792.8	764.157		
	Total	59	44566.5	83		
Internal rotation	Intergroup	3	181.560	60.550	0.329	0.402
	Within-group	56	10192.5	182.010		
	Total	59	10374.1	83		
External rotation	Intergroup	3	416.333	138.778	10.365	0.013
	Within-group	56	243.0	43.393		
	Total	59	659.333	-		

Table 8- The results of the correlated T of the ranges of motion in four groups in shoulder's abduction

Statistics→ group↓	Mean	Standard deviation	T	Level of significance	
Motion-therapy	Pre	48.53	8.6	3.12	0.024
	Post	50.5	5.9		
Massage therapy	Pre	49.1	6.6	2.15	0.035
	Post	51.3	6.2		
Mechanotherapy	Pre	48.6	4.2	4.11	0.025
	Post	53.6	4.9		
Compound	Pre	48.2	3.4	4.32	0.015
	Post	53.8	4.8		

The results of abduction of shoulder in four categories have been shown in table 8.

In EMG test, the reaction time of supraspinatus muscle in abduction ($p < 0.023$; 235.6 ± 45.4) and external rotation ($p < 0.051$; 232.6 ± 47.9) movements showed more significance ($p < 0.0026$). The reaction time of supraspinatus muscle in compound program ($p < 0.012$; 226.6 ± 5.3) and mechanotherapy ($p < 0.012$; 229.4 ± 3.7) was more significant.

Subscapularis muscle after supraspinatus one showed more significance in the reaction time (228.3 ± 4.7) and reaction delay (19.3 ± 6.6) in compound therapeutic program and other programs ($p < 0.015$). Since Teres minor muscle, that had little operation among rotator cuff muscles and since due to more depth it was not measurable ($p < 0.025$) this muscle was excluded.

Discussion

Compound therapeutic program had a significant effect on the increase in shoulders' range of motion among athletes who suffer from shoulder impingement syndrome. The results are consistent with Cetola et al that have introduced the conservative therapy as the selected treatment for patients who suffer from this syndrome [10].

In addition, results of the present research indicate that selected therapy method has more efficacy than motion therapy that is consistent with Senbursa et al who showed that exercise therapy in accompany with manual therapy, has more effectiveness than the exercise therapy [9]. In this research, although the injuries of shoulder joint in sport fields such as handball, judo, swimming, gymnastic, etc that stood for a significant percentage of injured case due to hard working of shoulder joint is obvious, the high prevalence of this disorder in volleyball players was considerable. The most common mechanism of shoulder impingement syndrome is raising hands and abducting the shoulders that in this position acromial process and upper edge of glenoid cavity of shoulder joint, is pressured by rotator cuff muscles specifically supraspinatus and result in severe and subsequently chronic tendonitis. When athletes raise their arms, their rotator cuff muscles will be exposed to tension. Supraspinatus tendon is placed under pressure between the head of humerus from below and acromial process and coracoacromial ligament from the top and lower edge of acromioclavicular joint. Because the tendon is critical in terms of blood supply, frequent rising of arms will cause the tendon to suffer from ischemia and degeneration and tendon pressure

in this stage will result in supraspinatus tendonitis [17].

As it is observed, in examining the results of the study, abduction and external rotation movements in compound program are considered as an effective treatment index. Because according to many specialists (Rupsig, Friendly, Herbert, etc) the improvement of abduction movement and shoulder external rotation refer to the treatment and preparation of shoulder to start the activity and main practices; however, until the complete improvement of symptoms, the injured athlete should continue his therapeutic program [9, 10, 18, 19]. In volleyball players whose hands are abducting and stretching continuously, this disorder is frequent in horizontal and vertical mode from the shoulder surface. As well, in wrestlers due to severe stretching of hands at the time of performing the techniques, in abduction movement from the shoulder and finally in all the pressures on shoulder joint this disorder is highly prevalent [4].

Torque (moment) and the angular velocity created in the shoulder joint, are the main factors of micro injuries of rotator cuff muscles tendons incidence in shoulder impingement syndrome. Moreover, based on various researches and torque and created angular velocity in the performance of shoulder movements, the most rate of disorder is created in abduction movement and the least rate of disorders is created in internal rotation. Therefore, increasing the abduction range of motion and external rotation as well imply the improvement of symptoms in the injured shoulder [3]. While discussing the biomechanical situation of rotator cuff muscles in swimmers' shoulder syndromes, one should consider that the rotator cuff tendons combine with the shoulder joint capsule and strengthen it. All of the muscles own the same stretching line and have a considerable role in the dynamic stability of the joint. When the power of each one disintegrates, one can observe that the rotation power of deltoid muscle causes not only the rotation of humerus, but also pushing the head of humerus into the glenoid cavity. In spite of the minor duty of negative displacing (downward), these muscles are equally important as well [20, 21]. All the three components of negative displacement that are resulted from rotator cuff muscles, will neutralize the positive displacing resulted from deltoid muscle and will get the necessary stability. However, when the repetition of shoulder movements causes the tendon pressure of these muscles in over head movements or complete range of motion of the shoulder joint, the balance of energy between displacements would disrupt and

result in impingement and chronic discomforts in the tendons of these muscles [6].

Therefore, although the subjects' sport experience in the present study was about eight years and their average age was under thirty years old, due to frequent kicks and over repeating movements of shoulder and more pressure than tolerance the compression and impingement of rotator cuff tendons muscles in the joint happened. Some researchers of Maryland University have concluded that such methods as friction massage, effleurage massage, water therapy, motion therapy (especially PNF exercises), hot and cold complex and of course drug therapy in acute cases have significant effect on the improvement of syndrome's complications in swimmers. The researchers believe that drug therapy is effective in the completion of rehabilitation program [5]. However, in the present research, researchers obtained good results without taking inflammatory drugs. Richardson et al achieved a significant difference between the pretest range of motion and that of posttest. Therefore, in EMG results, the reaction time of especially supraspinatus muscle and subscapularis in the external rotation and abduction movements has been decreased. In the present study, the range of motion of external rotation in the treatment in pretest showed a significant difference in comparison with that of posttest. Moreover, these results are consistent with those of Richardson et al [11].

In another research entitled "examining the prevalence rate of shoulder injuries accompanied with pain in wheelchair users", Margaret Finley et al, put 26 male athletes and 26 male non-athletes under a special clinical program including "exercise therapy" and "massage therapy". Measuring the painful range of motion, they recognized that 46% of the symptoms and clinical symptoms resulting from shoulder impingement syndrome have shown a considerable decrease. This combination is similar to the compound protocol of the present study. In the present study, most of the analyzed factors such as the pain rate at night, the rate of pain continuity, painful range of motion with and the rate of shoulder pain in posttest, have improved in comparison with the pretest that these results are consistent with those of Margaret Finley et al [12].

In another research entitled "examining the disorders of rotator cuff of and related pathomechanisms", Aboueei has used a training system including rhythmic consolidation movements, PNF exercises, and frictional massage. In that research, the researcher has pointed to the effects of inflammatory drugs and has shown that they are very effective. However, in

the present research during a four-week period, no inflammatory drug was used and many researchers including Rupsig from India don't know these drugs really effective. Therefore, the present research is not consistent with Aboueei's research from the mentioned point of view. However, the results of the two programs have shown significant improvements [13]. Herbert has used massage therapy in combination with exercises therapy in individuals who had high shoulder inflammation. At the end of the treatment period, satisfactorily results are achieved in obtained results from the range of motion and medical-sport questionnaire because of this combination. In this research, the range of motion of shoulder in external rotation was significant and in EMG, the reaction time of supraspinatus muscle decreased as well that resulted in improvement after 6 weeks of therapeutic program that was similar to the compound program used in this research considering the range of motion (external rotation) and clinical tests [7]. PNF stretching movements showed a significant effect on the improvement of swimmers' shoulder syndrome in elite athletes that had consistency with other studies. Lintel et al examined the effects of PNF heat therapy and cold therapy on shoulder flexibility. Results indicate that the combination of PNF flexibility exercises with cold therapy increases the flexibility of shoulder and improves the activity of shoulder muscles. The results are consistent with the results of the present study; because PNF exercises in increasing the range of motion and decreasing the shoulder joint limitation has had a significant effect. The effects of massage therapy have been proved in various researches.

In a research, that Peng Woo has conducted in Hong Kong entitled "superficial stroking massage effects on discomfort and shoulder pain of old injured patients" has considered the rate of pain, level of discomfort, blood pressure, and heart rate of 102 patients. The results of massage therapy group and those of control group showed that the superficial stroking massage significantly decreases the rate of tenderness and the pain of patients and results in maintenance of psychophysiological parameters until three days after massaging [22]. This research is consistent with the present research as well; because, massage therapy has been effective on decreasing the signs of discomfort and increasing the range of motion of the shoulder joint. Parade has compared three methods of massage therapy, manual therapies and special treatment exercises in 25-member groups on chronic shoulder pain. The results show that in the compound group 63%, in massage therapy 21%, and in special

treatment exercises 14% improvement have been achieved [23]. It is indicative of high-efficiency of compound therapies on this disorder. Yet in another research, Bruce analyzed the effect of deep frictional massage and motion therapy on the shoulder tendonitis. In this research, Bruce compared the two groups. He gave one group the deep frictional massage with motion therapy and he only used motion therapy for the other group. Results show that the combination of deep frictional massage with motion therapy is not a beneficiary clinical agent because massage cannot eradicate the underlying discomfort; therefore, a program should be designed and performed to increase the power and muscular activity of the shoulder joint. Bruce emphasizes on the necessity of strength and stretching exercises such as PNF stretching exercises as a particular system and proves the results of his study.

At the end, one can state that regarding the more effectiveness of selected treatment period, using motion therapy with decreasing the symptoms and pain signs can cause preliminary cure. Massage therapy with increasing the range of motion and elimination of muscular spasms plays an effective role in decreasing temporary pains and discomforts. PNF stretching exercises can solve the underlying discomfort by increasing the flexibility and static-dynamic power [3]. In this research, the results of compound therapeutic program indicated more efficacy of this treatment protocol in comparison with other programs. The range of motion with painful external rotation in the posttest compound program was more significantly different from the mechanotherapy program. The difference was possibly resulted from the limitation of motion during the painful range of motion of the shoulder that after the treatment, because of performing the CRAC exercises, it has led to increase in the range of motion significantly in compound therapy and relaxation methods of massage therapy. Regarding more effectiveness of the selected treatment period, using the treatment methods individually, massage therapy and strength therapy based on the findings of this research and the results of Bruce's studies, Finley, Herbert, and Aboueei are suggested for shoulder impingement syndrome, since one can enjoy all the benefits of selected treatment methods that are among the best methods simply and completely.

Conclusion

The compound therapeutic program shows the treatment effects on the motion performance of rotator

cuff muscles, especially in supraspinatus muscle in MRI examination, clinical tests, EMG test and patients' report of health. However, the way of combining these methods, depending on the intensity of the disorder needs more consideration. Regarding the fact that supraspinatus muscle acts sooner in shoulder movements and has the greatest role in shoulder operation, it is necessary for it to be treated and rehabilitated earlier than the other muscles. Moreover Subscapularis muscle, due to the protective role in the movements of Subscapularis and other muscles should be placed in the next priority of treatment that the best solution is the controlled compound therapeutic program in the clinical environment.

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