



Case Study

Physical therapy in patients over 60 years of age with a massive and irreparable rotator cuff tear: a case series

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Abstract. [Purpose] Describe the effect of a Physical Therapy (PT) program in function improvement and pain reduction in patients over 60 years of age with massive and irreparable Rotator Cuff (RC) tear. [Participants and Methods] Ninety-two patients received a 12 weeks PT program that consisted in manual therapy and a specific exercises program. Before the start and at the end of the treatment, the shoulder function was assessed with Constant-Murley, the upper extremity function with DASH, and the pain during activity with the visual analog scale (VAS). [Results] At the end of the treatment, Constant-Murley exhibited an increment of 24.9 points, DASH showed a decrease of 28.7 points, and the VAS, a decrease of 3.6 cm ($p=0.00$). [Conclusion] A PT program based on manual therapy and specific exercises in a short term improves the function and reduces the pain during activity in patients with a massive and irreparable RC tear.

Key words: Rotator cuff tear, Physical therapy, Exercise therapy

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INTRODUCTION

There is no consensus regarding the definition of a Massive Rotator Cuff Tears (MRCT)¹⁾. Many classifications systems have been proposed to help guide the evaluation and treatment, Cofield classified MRCT as tears that are >5 cm in size in either the anterior-posterior or medial-lateral dimension²⁾. Gerber defined massive tears as those involving complete tears of two or more tendons³⁾. Recently, Collin et al.⁴⁾ divided the tear of the Rotator Cuff (RC) topographically in five components, this classification not only subclassifies massive tears but has also been linked to function, particularly the maintenance of active elevation. RC disease is a common finding in older adults, at least 30% of individuals aged older than 60 will have a full-thickness RC tears⁵⁾. MRCT is rarely due to an acute injury, it is usually of chronic evolution, and is associated to a series of degenerative changes such as myotendinous retraction, loss of musculotendinous elasticity, fatty infiltration of muscles, static (superior) subluxation of the humeral head, and ultimately, glenohumeral osteoarthritis⁶⁾. When there is a static superior migration of the humeral head, a narrowed or absent acromiohumeral interval (less than 7 mm), and grade III or IV fatty infiltration according to the Goutallier classification, the probability of success of a surgical repair of the RC is very low and it is, therefore, called a massive irreparable tear^{6, 7)}.

Despite the high prevalence of RC tears, the therapeutic management of these injuries is still controversial⁸⁾, specially the

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MRCTs^{1, 4, 6, 7, 9}). For Tashjian, all elderly patients with a massive and/or irreparable RC tear should start with a conservative treatment¹⁰, nevertheless, the effectiveness of physical therapy (PT) and therapeutic exercise (TE) in this clinical condition is not well-established¹¹. The systematic review (SR) of Ainsworth et al.¹¹, based on observational studies, showed limited evidence of the effectiveness of the TE in patients with MRCT. In addition, due to the high variability in the protocols used, it is not possible to determine what type, dose and progression of TE should be prescribed to these patients. On the other hand, the narrative review of Edwards et al.¹² showed that the conservative treatment is effective in 73% to 80% of the patients with RC tear, although it is important to understand that the patients' response capacity and the recurrence of the symptoms will determine the possibility of a successful result of the TE.

The objective of the study is to investigate in the short term the effect of a PT program in function improvement and pain reduction in patients over 60 years of age with massive and irreparable RC tear.

PARTICIPANTS AND METHODS

The study was approved in February 2017 by the Ethics Committee of the Chilean Central Metropolitan Health Service. Between 2015 and 2017, ninety-two prospective patients over 60 years old with massive and irreparable RC tear were recruited. The diagnosis was performed by an orthopaedic surgeon based on imaging studies that included anteroposterior projection radiographs, axial and outlet; ultrasound, and magnetic resonance imaging. The patients included presented complete tear of 2 or more tendons of the RC and a grade III or IV fatty infiltration according to the Goutallier classification. Patients with acute traumatic injury of the RC, with other pathologies of the shoulder joint complex (proximal humerus fracture, adhesive capsulitis and glenohumeral instability, etc.) and with previous surgery of the affected shoulder, were excluded.

Under prior informed consent, two evaluations were performed, one at the beginning of the treatment and the other on week 12, at the end of the PT program. In these assessments, the shoulder function was evaluated with the Constant-Murley questionnaire¹³; the upper extremity function, with the disabilities of the arm, shoulder and hand questionnaire (DASH)¹⁴, and the pain during activity with the visual analog scale (VAS)¹⁵.

All patients received a PT program using as a reference the clinical decision algorithm proposed by Klintberg et al¹⁶. Two techniques of manual therapy were applied to those patients who presented limitation of the passive movement: "posterior glenohumeral mobilization" with the patient in supine decubitus position with 30° or 40° abduction and slight external rotation of the shoulder, first, an axial distraction in inferior direction and then a posterior glide maintained for 1 minute¹⁷. A "scapular mobilization" with the patient in lateral decubitus position was also performed¹⁸. For both techniques, 8 to 10 repetitions were executed with a 30 seconds rest between each one. The specific exercises program starts with conscious muscle control to improve proprioception and normalize the scapular and glenohumeral resting position, continuing with scapular control exercises, and finally, glenohumeral control exercises are prescribed to restore centralization and prevent the superior translation of the humeral head. The general principles of the program are; the exercises should not reproduce pain, only mild to moderate pain levels (<4/10 on VAS) are accepted after the session; a maximum of 4 exercises per session; begins with low load/low activation exercises, with the arms below the level of the shoulders, emphasizing the quality of the performance of the motor task, performed slowly, consciously and progressively, and during the course of the program the feedback is gradually diminished, until the realization of exercises subconsciously and automatically. Two weekly sessions over 12 weeks were carried out¹⁶.

All collected data were entered into the Excel for tabulation, and the statistical analysis was performed with the Stata 11.0 program. The quantitative variables are presented as a mean and standard deviation (SD). To determine the statistical tests to be used to analyze the data, normal distribution was first evaluated with the Shapiro-Wilk test. To carry out the comparison of the data pre and post treatment for the Constant-Murley, DASH and VAS during activity variables, the t-test or the Mann-Whitney test was used depending on the result of the normality evaluation, and in both cases, a level of significance of 0.05 was set.

RESULTS

The results of the basal characteristics of the group studied are presented in Table 1. Thirty patients (32.6%) presented Pseudoparalysis, defined as an active anterior elevation of the shoulder of less than 90° with a preserved passive movement range^{4, 9}. During the study there were no losses or withdrawals, and at the end of the PT program no patient informed of complications associated to the treatment received.

At the moment of analyzing the normality hypothesis with the Shapiro-Wilk test, this was rejected only for the VAS variable ($p < 0.05$). In accordance with this, the t-test was used to carry out the comparison of the Constant-Murley and DASH variables, and the Mann-Whitney test was used for the VAS variable. Table 2 shows the values of the evaluated variables pre and post PT treatment, and the effect of the treatment. For the functional variables, the Constant-Murley showed an increment of 24.9 points ($p = 0.00$), and the DASH showed a decrease of 28.7 points ($p = 0.00$). For the pain during activity variable the VAS showed a decrease of 3.6 cm ($p = 0.00$). All differences are clinically and statistically significant¹⁹⁻²¹.

Table 1. Baseline characteristics of patients with MRCT

Variables	Patients with MRCT (n=92)
Gender female, number (%)	55 (59.8)
Age (years), mean \pm SD	67.9 \pm 4.5
Symptom duration (months), mean \pm SD	16.5 \pm 8.6
Dominant shoulder affected, number (%)	65 (70.7)
Pseudoparalysis, number (%)	30 (32.6)
Type A MRCT, number (%)	13 (14.1)
Type B MRCT, number (%)	19 (20.7)
Type C MRCT, number (%)	1 (1.1)
Type D MRCT, number (%)	58 (63)
Type E MRCT, number (%)	1 (1.1)

MRCT: Massive Rotator Cuff Tear; SD: Standard Deviation.

Table 2. Comparison of the results between baseline and the 12th week

Variables	Baseline (mean \pm SD)	At 12th week (mean \pm SD)	Difference (mean \pm SD)	CI 95% difference	p value
Constant-Murley	38.4 \pm 16.1	63.3 \pm 16.6	24.9 \pm 13.7	27.8–22.1	0.00 †
DASH	63.9 \pm 16.4	35.3 \pm 17.4	28.7 \pm 13.4	25.9–31.4	0.00 †
VAS during activity	5.6 \pm 0.97	1.9 \pm 1.5	3.6 \pm 1.1	3.4–3.8	0.00 ‡

SD: Standard Deviation; CI 95%: Confidence Intervals 95%; DASH: Disabilities of the Arm, Shoulder and Hand questionnaire; VAS: Visual Analog Scale.

†Obtained with Student's t-test for dependent samples.

‡Obtained with the Mann-Whitney test for dependent samples.

DISCUSSION

The results of our study show that a group of patients with a massive and irreparable RC tear presented a significant improvement of posterior functionality at the completion of a 12-week PT program, during which manual therapy techniques and a program of specific exercises were applied.

The therapeutic management of MRCT is controversial; multiple therapeutic options have been proposed without reaching a consensus^{1, 4, 6, 7, 9}). Several factors contribute to this lack of consensus: the definition of “massive” tear is not clearly standardized, there are various classification systems with diverse criteria to define it²⁻⁴). In our study we have used the criteria proposed by Gerber et al.³), and by Collin et al.⁴). Few studies have tried to establish the relation between the pattern of the tear and the patient's clinical case. The studies of Collin et al.^{4, 22}) describe this relation but more studies are needed to support it. Even though fatty infiltration is an irreversible condition that negatively influences the results of a surgical repair of the RC²³), no relation has been established with the patient's clinical case and the response to the treatment with therapeutic exercises⁴).

In our study, we applied a standardized PT treatment taking as a reference a clinical decision algorithm proposed by a panel of experts. The algorithm emphasizes that PT treatment decisions should be based on physical assessment findings and not structural pathology¹⁶). Two manual therapy techniques were applied to those patients who presented a decrease in the glenohumeral and scapulothoracic passive range of motion^{17, 18}). Then a specific exercises program was performed to correct muscle deficits and thus restore the alterations of the scapular and glenohumeral dysfunctional kinematics. Glenohumeral control exercises for restore centralization of the humeral head, and strengthen the scapula stabilizer muscles were performed. This strategy of exercises at three months reduced pain and improved function of the shoulder and upper extremity.

There are few studies regarding the effect of PT in this group of patients. Ainsworth²⁴) applied to 10 patients with massive and irreparable RC tear a 12 week treatment program consisting of education, postural correction, re-education of muscle recruitment, strengthening of anterior deltoid and teres minor muscles, stretching, proprioceptive exercises and functional adaptation. At the end of the treatment, they showed an improvement in function and quality of life. Levy et al.²⁵) applied to 17 patients with massive and irreparable RC tear a 12 week structured program of rehabilitation to strengthen the anterior deltoid. After 9 months, follow-up showed a decrease in pain, an improvement in function and range of movement. Baydar et al.²⁶) applied to 20 patients with a full-thickness RC tears an exercise program in 3 phases. In phase 1, Codman's pendulum exercises, passive exercises on all planes, and stretching of the posterior capsule were carried out; in phase 2, exercises to strengthen the remaining muscles of the RC, scapular stabilizers and deltoid; in phase 3 the patients went back to their normal

activities. After 6 months, follow-up showed a decrease in pain and improvement in the range of movement, strength, function and quality of life. Kuhn et al.²⁷⁾ applied to 422 patients with atraumatic full-thickness RC tears a 6-week PT program consisting of specific exercises to improve the range of movement, the flexibility and strengthening of the muscles of the RC and scapula. During follow-up on week 6 and 12 the patients showed an improvement in the range of movement, function and quality of life related to health. Collin et al.²²⁾ applied to 45 patients with massive and irreparable RC tear a 5 sessions rehabilitation program with the following objectives: alleviate the pain and the muscle tension of the pectoralis minor, upper trapezius and scapula elevator muscle; restore the centralization of the humeral head; strengthen the scapula stabilizer muscles; work-out the stabilizing function of the deltoid when elevating the arm; recover proprioception and movement automatism through a neuromotor rehabilitation focused on the integration of movement. After 2 years of follow-up 24 patients recuperated over 160° of anterior shoulder elevation. Christensen et al.²⁸⁾ applied to 30 patients with irreparable RC tear a 5-month rehabilitation program consisting of: education and a supervised exercise program to strengthen the anterior deltoid and teres minor muscles. At the end of the treatment patients showed a decrease in pain, improvement in the range of movement, function and quality of life.

Our results agree with those reported in the literature. All studies that used the Constant-Murley questionnaire showed statistically significant changes^{22, 25, 26)}, and a difference of over 23 points to obtain a minimally perceptible change^{25, 26)}. None of the previous studies used the DASH questionnaire to evaluate its patients. In our study we found a difference of over 15 points, obtaining an important minimal clinical difference²⁰⁾. Neither did we find reports on the use of VAS to evaluate pain intensity during shoulder movement, we found a decrease of over 1.4 cm, also considered an important minimal clinical difference²¹⁾.

This study has several limitations. Since it is a descriptive study it does not have a control group, neither was a randomized sample strategy used to select the patients. And also a follow-up was not considered to evaluate the results in the long term. In summary, a PT program based on manual therapy and specific exercises in the short term improves function and reduces pain during activity in patients over 60 years of age with a massive and irreparable RC tear.

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Conflict of interest

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