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Long-term post-operating functionality of rotator cuff repair

Isabela Ferreira dos Santos[1], Francklin Trindade da Silva[2], Thiago Domingues Stocco[3,4,*]

[1]Hospital Israelita Albert Einstein, São Paulo, Brasil.
[2]Faculdade de Ciências Médicas da Santa Casa de São Paulo, São Paulo, Brasil.
[3]Universidade Santo Amaro (UNISA), São Paulo, SP, Brasil.
[4]Faculdade de Ciências Médicas da Universidade Estadual de Campinas (UNICAMP), Campinas, SP, Brasil.

ABSTRACT

OBJECTIVE

The purpose of this study was to late assess the functionality of patients undergoing surgery to repair the rotator cuff.

METHODS

Cross-sectional observational study performed at the UNISA Orthopedics and Rheumatology clinic, approved by the ethics committee followed by CAAE 07824918.0.0000.0081. The sample was consisted of individuals who underwent rotator cuff repair for at least two years and who have already undergone postoperative rehabilitation. For the evaluation, a specific self-report questionnaire was applied to assess rotator cuff dysfunctions, the WORC, and the FIT-HaNSA test, a functional test that consists of performing 3 tasks that require the elevation of the upper limb.

RESULTS

A convenience sample of 9 individuals participated in this study, of both genders (5 men and 4 women) with a mean age of 54.1 years (± 3.4 years). The results in all the tasks of the FIT-HaNSA test, showed a greater functional deficit in the operated limb compared to the contralateral limb. In the WORC questionnaire, the sample subjects showed better scores as the post-surgical time increased.

CONCLUSIONS

Although sample participants demonstrate better results in WORC over time, in the functionality test it was observed that patients undergoing rotator cuff repair have a long-term deficit in functionality, even after undergoing rehabilitation.

DESCRIPTORS

Rotator Cuff Injuries, Shoulder, Functional assessment.

RESUMO

OBJETIVO

O objetivo deste estudo foi avaliar tardiamente a funcionalidade de pacientes submetidos à cirurgia para reparo do manguito rotador.

MÉTODOS

Estudo observacional transversal realizado na clínica de Ortopedia e Reumatologia da UNISA, aprovado pelo comitê de ética seguido pelo CAAE 07824918.0.0000.0081. A amostra foi constituída de indivíduos que foram submetidos ao reparo do manguito rotador à mínimo de dois anos da data da cirurgia e que já realizaram reabilitação no pós-operatória. Para a avaliação foi aplicado um questionário de auto relato específico para avaliar as disfunções de manguito rotador, o WORC, e o teste FIT- HaNSA, um teste de funcional que consiste na realização de 3 tarefas que exigem a elevação do membro superior.

RESULTADOS

Participaram deste estudo uma amostra por conveniência de 9 indivíduos, de ambos os gêneros (5 homens e 4 mulheres) com média de idade de 54,1 anos (± 3,4 anos). Os resultados em todas as tarefas do teste FIT- HaNSA apontaram um déficit funcional

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maior no membro operado em comparação com o membro contralateral. No questionário WORC os indivíduos da amostra demonstraram pontuações melhores à medida que aumentam o tempo de pós-cirúrgico.

CONCLUSÃO

Embora os participantes da amostra demonstram resultados melhores no WORC com o passar do tempo, no teste de funcionalidade foi observado que pacientes submetidos a reparo de manguito rotador possuem déficit de funcionalidade à longo prazo, mesmo após realizarem reabilitação.

DESCRITORES

Lesões do manguito rotador, Ombro, Avaliação funcional.

Corresponding author:
Thiago Domingues Stocco
Universidade de Santo Amaro - Campus I, Rua Professor Enéas de Siqueira Neto, 340, Jardim das Imbuias, São Paulo, SP, Brazil, *E-mail:* (tdstocco@live.com)
ORCID ID: https://orcid.org/0000-0001-5703-5624

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INTRODUCTION

The shoulder joint complex is the most mobile and complex joint in the entire human body, comprising five joints[1]. Each joint has its degree of movement and stability dependent on the capsule-ligament structures, the appropriate function of the muscles that compose it and the integrity of the articular and bone structures, being the perfect synchrony between the structures involved responsible for the wide movements of the upper limbs. Due to the integration of several joints, the shoulder joint complex becomes especially susceptible to injuries and dysfunctions[1,2].

The muscles that make up the shoulder joint complex have the function of providing the upper limbs with different ranges of motion, precision, and function necessary for numerous activities. Among them, a muscle group deserves to be highlighted: the rotator cuff (RC)[3]. RC injuries are responsible for about 70% of the causes of shoulder pain[4]. The main causal factors for RC injuries are repetitive microtrauma, tendinopathy due to traction overload, poor vascularization, acromial anatomy and direct trauma[2,5]. Individuals affected by the RC injury may present a decrease in the strength of the affected limb, limited range of motion, crackling in movement, alteration of the scapulohumeral rhythm when often accompanied by lateral or anterior pain of the shoulder, with greater intensity of movement[6, 7].

There is still a lot of debate about the treatment of RC injuries. Some studies have shown satisfaction and good results with conservative treatment while others contest showing that surgical repair, such as suturing, acromioplasty and debridement, lead to better and more lasting results[8-12].

Most rehabilitation protocols in the postoperative period of RC have as criteria for discharge the relationship between the patient's symptoms and difficulty in performing exercises from the rehabilitation program, often ruling out quality of life levels, emotional factors and patient satisfaction performing their daily tasks, using only physical exams and complementary imaging exams[13,14].

One of the tools used to evaluate shoulder function, regardless of its pathology, is the application of questionnaires for self-assessment of function, used both in clinical practice and in scientific research[15-16]. An example is The Western Ontario Rotator Cuff Index (WORC), a quality-of-life questionnaire[17], created specifically for patients with RC dysfunctions, from subacromial impact syndrome to MR[18] muscle and tendon injuries and ruptures.

In addition, functional tests have also been developed to evaluate the functionality of the upper limb, including the Simple Shoulder Endurance Test and the Functional Impairment Test-Hand and Neck/Shoulder/Arm (FIT-HaNSA) . This last test, developed to assess muscle endurance during activities that represent different aspects of the gross motor activity of the upper extremity, consists of performing three tasks that simulate repetitive activities of sustained elevation of the upper limb, a movement that requires functionally from the RC[19,20].

Although previous studies have shown that short- and medium-term results are considered good or excellent in patients undergoing RC repair, these studies did not consider the long-term functional performance of patients[21-22].

Thus, we hypothesized that there may be a long-term functional deficit in patients undergoing RC repair, with respect to their well-being and the performance of tasks that require greater muscle endurance, even after a rehabilitation program. This would indicate a greater emphasis on changing the discharge criteria of physical therapists. Therefore, the objective of this study was to evaluate the function of upper limbs of patients submitted to repair of lesions in the RC surgically late.

METHODS

This is a cross-sectional, quantitative, and qualitative observational study. Held at the Physiotherapy Clinic of the Santo Amaro University (UNISA), approved by the Ethics and Research Committee, under opinion 3,154,808 and CAAE: 07824918.0.0000.0081.

The sample consisted of individuals who underwent rotator cuff repair for at least two years and who underwent a post-operative rehabilitation program. Individuals aged between 30 and 60 years old, of both sexes, who underwent surgery to repair the rotator cuff in the last 48 months or more, who had undergone rehabilitation in the postoperative period and were discharged were included. Individuals with a history of other pathologies of the shoulder joint complex and with recurrences that led to a reoperation, in addition to any change in the general physical state that makes it impossible to perform the test, were excluded from the study.

Thus, the study was composed of 9 individuals (5 men and 4 women), with a mean age of 54.1 (± 3.4) years. The volunteers were submitted to a single questionnaire of basic data after the signature and clarification of possible doubts of the informed consent form. The individuals answered the ques-

tionnaire alone, but the evaluator was present if there was a need to clarify doubts.

Then, the WORC questionnaire was applied to collect data about the physical, emotional, and social well-being of individuals with RC injury, and the FIT-HaNSA test was applied individually. Details on the WORC questionnaire and the FIT-HaNSA test are described below.

WORC questionnaire

The WORC questionnaire consists of 5 domains, divided into: Physical Symptoms, Sport / Recreation, Work, Lifestyle and Emotions[17]. Everyone responded according to their perception, varying the score from 0 to 10 based on the visual analog scale (VAS), where lower values represent better results.

Section A are related to physical symptoms perceived by patients in relation to their affected shoulder. Composed of 6 (six) questions ranging from answers between “No pain” and “Extreme pain”, “No weakness” and “Extreme weakness”, “No rigidity” and “Extreme rigidity” to score each question.

Section B quantifies how much the shoulder has affected sports and / or recreation perceptible by the individual, with a composition of 4 (four) questions ranging between the answers “Not affected” and “Extremely affected”, “No fear” and “Fear extreme”, “None” and “Extreme” to score each question.

In Section C the questions are directed at work, considering domestic and work activities. Composed of 4 (four) questions quantified between “None” and “Extreme” or “Never” and “Always”.

In sections D and E are questions related to lifestyle and emotions, respectively. Section D consists of 4 (four) questions qualified in “None” and “Extreme. Section E has in its composition 3 (three) questions quantified between “None” and “Extreme”, “None” and “Extreme”. The total score being 0 to 2100, and the interdependent score for each section are as follows: Section A - 0 to 600 points; Section B - 0 to 400 points; Section C - 0 to 400 points; Section D - 0 to 400 points; Section E - 0 to 300 points, considering that the higher the score the worse the individual's state.

FIT- HaNSA test

The Fit-HaNSA test was applied according to the protocol previously described19. Briefly, the test consisted of three tasks that simulate repetitive tasks with the upper limb elevated.

In the first task, a shelf was placed at the height of the individual's waist and another 25 cm above it; 3 1kg containers are placed 10cm apart from each other on the lowest shelf. Using the compromised upper limb, the volunteer raised one container at a time to the highest shelf, at a speed of 60 beats / minute, controlled by a metronome (Figure 1A).

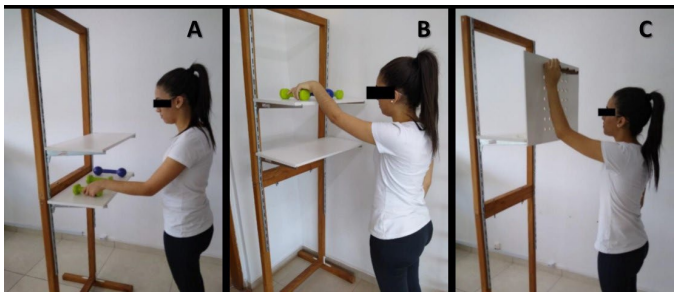

Figure 1. FIT-HaNSA test. Task "Waist-up" (A), Task "Eye-down" (B) and Task " Overhead Work" (C). (Source: Author).

In the second task, a shelf was placed at eye level and another 25 cm below it. The individuals were again instructed to use the affected upper limb to lift the 3 containers from one shelf to another in a time of 60 beats / minute of the metronome (Figure 1B).

In the third task, a shelf was attached at eye level with a dock able plate attached to it, perpendicular to the shelf, projected towards the volunteer. He was instructed to use both arms to tighten and loosen screws repeatedly using a specific pattern. The pattern was: the screw at level 1 (top) should go to level 2 (middle); move the screw from level 3 (bottom) to level 2 and the screw from level 2 to level 3 (Figure 1C). If any screws fell during the procedure, the volunteer was instructed to remain with the limbs elevated while the evaluator made a new screw available. If the volunteer forgets the pattern of movement of the screws, he could ask the appraiser without failing to keep his arms raised. The task was concluded when all the screws were repositioned until the end of the plate.

Between each task, a rest time of 30 seconds was provided (time used by the evaluator to reorganize the shelves). The tasks were performed for a maximum of 300 seconds, or even when the volunteer used one of the criteria to interrupt the test: fatigue or extreme pain or when the evaluator perceives that the evaluated person replaces using the trunk movement and cannot correct with feedback after 5 attempts in a row.

The results were considered in relation to the seconds it took to perform each task. A stopwatch was used to record the time and each task was performed three times on each member.

To perform the Fit-HaNSA test, a device adapted according to the measurements provided by the creator of the test and based on its original form was made.

Statistical analysis

From the values obtained, descriptive statistics were used to present the results and compare the sample data. The results were expressed as mean and standard deviation and the appropriate statistical tests applied: The unpaired Student t test was performed to compare the values of the FIT-HaNSA test between the affected and unaffected limbs. For the test, the significance level was 95% ($p < 0.05$). To correlate the time of surgery and the results of the WORC questionnaire, Pearson's correlation was used. Minitab ® statistical software (version 17, Minitab Inc., StateCollege, USA) was used.

RESULTS AND DISCUSSION

In the present study, all research participants completed the work without complications. From our sample, 77.78% of the individuals underwent the arthroscopy procedure and 22.22% the open surgery procedure. Of this composition, 11% placed an anchor, 22% the acromioplasty procedure with suture, 11% simple suture, 33.3% placement of three anchors and 22.2% placement of two anchors. According to the study by Miyazaki et al.[22] individuals from 50 years of age are the most affected shoulder injuries and preferably submitted to arthroscopic repair with the following techniques: single row with single suture, double row, and the translated suture technique. According to the findings of the work by Veado et al.[23], all the techniques mentioned above present good results when evaluated pre and postoperatively in a minimum follow-up of 12 months, through a self-report questionnaire.

In relation to the dominance side and the affected limb between individuals, it is proved in this study that all patients evolved with symptomatic symptoms and later the identification of the lesion on their dominance side, the majority being right-handed (98%), corroborating with the study by Garzedin24 showing that the right limb, being the predominant one, is the most affected. Among the joints of the upper limb, the shoulder is predominant in pain complaints. According to Christiansen et al.[25], the dominant side has no significant in-

fluence on results in the WORC questionnaire. The dominant side only influences certain tasks that require greater dexterity from the limb used.

After the surgical procedure, the individuals were instructed to undergo physical therapy rehabilitation. The average number of sessions performed by them was 54.6 (± 21.9) sessions until discharge, estimated at around 5 months, excluding the immobilization time. Converging with the literature, the data help in the thesis that it is not possible to determine a standard time for the rehabilitation process in these cases. Immobilization time, surgical approach, pain, beginning, and conducts performed in physiotherapy and patient education with home exercises are determining variables in the total time of the physiotherapy program[26,27].

To analyze physical, social, and emotional well-being, the WORC self-report questionnaire was applied, exclusively for rotator cuff pathologies. Obtaining the average of each section and the total score, shown in Table 1.

WORC questionnaire	Average	Standard deviation	Coefficient of variation
Section A – physical symptoms	187,8	±176,3	94%
Section B – sports / recreation	132,2	±164,4	124%
Section C – work	143,3	±153,4	107%
Section D – lifestyle	116,7	±138,0	118%
Section E – emotions	70,0	±84,0	120%
Total score	650,0	±696,8	107%

Table 1. Result obtained from the WORC questionnaire.

The table shows that there is a wide variation between the responses of individuals, in each section. Section A addresses questions about physical symptoms, questioning issues such as acute pain and even relationships of shoulder weakness experienced in the past week. Studies such as the one by Williams et al.[28] demonstrate that postoperative pain is common up to the 2nd week for patients with a surgical approach between arthroscopy and open surgery due to soft tissue manipulation, but after this period there is no relatively significant difference. The pains involving the cervical-shoulder segment are explained due to the anatomy of the stabilizing muscles of the scapulo-thoracic joint, since they present some disorder that alters the biomechanics of the glenohumeral joint. So, the high score in the question can be explained: "How much discomfort do you feel in the neck muscles because of your shoulder?" In section A, category of physical symptoms.

Section B, covering topics such as sport / recreation considering responses from your lifestyle in the last week. Although few individuals reported practicing physical activities before undergoing the surgical procedure, they reported fear of performing some physical activity and injuring the affected limb again. Merolla et al.[29] reports in their study that athletes tend to postpone the repair of RC due to the return of their physical fitness level when compared to the previous one. One of the individual comments:

"... I had difficulty before carrying out the operation, so now I don't even risk it, it will hurt again, or I will feel pain again as before."

Section C refers to how much the shoulder interferes with work inside and outside the home environment. Síren et al.[30] concluded that a considerable proportion of disabilities and pensions due to shoulder injuries could be avoided by reducing physical and psychosocial exposures at work at a low level. One of the participants comments:

"... since I operated on my shoulder, I cannot work like I used to, I'm afraid of being fired. The age that contributes is no longer enough, I have one more factor that generates more expenses and less profit within the company".

Thinking about the interference that the post-surgical procedure can cause changes or alterations in the individual's lifestyle and emotions, section D and E address this theme. Bleyer et al.[31] considers nighttime awakenings and pain during sleep, there was a significant association in athletes from Santa Catarina. This result corroborates the results of Fietze et al.[32] who report that nighttime awakenings, in some way, influence both the quality of sleep and the sensation of pain.

The factors that influence physical, emotional, and social well-being can interfere in the first post-surgical years, and in the long run individuals seem to adapt and for most volunteers it is not considered an important barrier for their lives. The study by Ravindra et al.[33] describes the importance of mental health in RC pathologies for improving postoperative pain and functionality, indicating lower rates in the WORC questionnaire with an emphasis on the emotions section.

The time of surgery also interferes with the results. Figure 2 shows a strong correlation between the time of surgery and the results of the WORC. It is possible to observe that the longer the time after surgery, the lower the score on the questionnaire. It is possible to explain the low values in the general WORC score due to the adaptation of individuals to their new condition of life. In the literature, there is no guideline or protocol, which has a reference value and / or standard of fixed results, to predefine a low or high value, thus making it difficult to understand and treat the results obtained from the questionnaire. A study that correlates the WORC questionnaire with self-report questionnaires, which when compared, have a strong correlation between them[33].

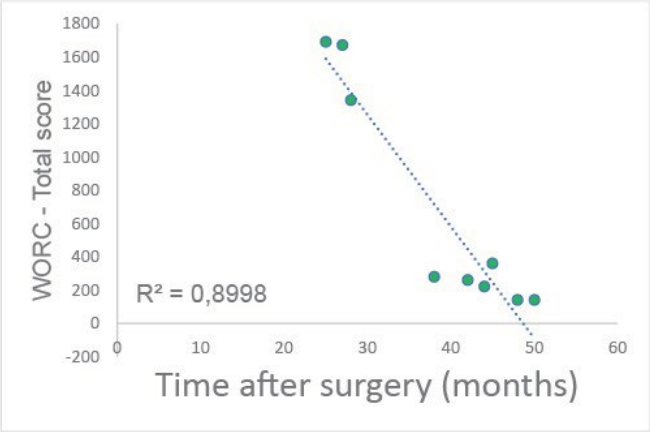

Figure 2. Correlation of post-surgical time with the total score of the WORC questionnaire (R2= Pearson's correlation coefficient).

Regarding the FIT-HaNSA test, the total score was calculated with an average between the tasks performed with the affected limb compared to the unaffected limb, shown in Table 2.

Table 2. Average time in seconds obtained in the FIT-HaNSA test (p <0.05).

FIT- HaNSA Test Tasks	Affected Limb	Unaffected Limb	p value
Task 1- Waist-up	14,33 (± 2,12)	12,00 (± 2,96)	*0,0725*
Task 2- Eye-down	12,78 (± 0,97)	11,11 (± 0,78)	*0,0010*
Task 3- Overhead work	64,44 (± 1,24)	62,11 (± 2,76)	*0,0342*

Although all results show a difference, task 1 did not show statistically significant results. One hypothesis for this is, the fact that this task does not require muscle activation of many

muscles since it is performed below the shoulder line. Although the participants had a maximum time of up to 300 seconds to perform the tasks, the more time spent, the greater the functional deficit presented by them[34]. When asked about pain during the test, 98% reported no pain and 2% classified it as discomfort or tiredness.

A healthy member can perform tasks 1 and 2 with a time equal to or less than 13 seconds, following as a basis for a longer time to be considered a deficit in the functionality of the tested member[25]. This corroborates with the result exposed in the study, in which most of the sample presents a reduction of this time, using the unaffected limb, showing good functionality.

Task 2 demonstrated a statistically significant difference between the members. The task requires the participant to raise the shoulder above the headline, using the supraspinatus as the main muscle, which tends to be the most affected in rotator cuff injuries[22]. The elevation of the upper limb at eye level simulates functional activities of daily living, reproduced in the second task of the test. The reduction in time to perform the second task can be explained by greater familiarity and learning, compared to the first task.

In a study by Ricci et al.[35] found that when the main objective is to reach a target, the early activation of the descending trapezoid associated with the high activity of the anterior serratus promoted proximal stability. On the other hand, they also concluded that weight-bearing activities required activation of the descending trapezoid not only at the beginning, to stabilize the upper extremity. Thus, we understand that activities, despite being considered simple, require good neuromuscular activation, which in the surgical process is deficient. Achieving a good recovery through rehabilitation programs to return to life activities without prejudice to quality. The rehabilitation time can interfere in results close to the expected standard as well as good behaviors that include gain in the range of motion and improvement in muscle strength as recommended in the rehabilitation protocols has its merit.

Although the individuals in the sample demonstrate good results in the WORC questionnaire, the results obtained in the FIT-HaNSA test demonstrate a deficit in functionality related to physical issues while the psychosocial aspects are preserved. These results can be explained by the WORC questionnaire being self-reported and in the long run individuals adapt to their new living conditions.

Although it is important to consider that the present study has a limited sample size, there are no studies in the literature to relate deficits in functionality and general well-being in individuals after two or more years of surgical treatment of the rotator cuff, considering this unprecedented work and of paramount importance.

CONCLUSION

As analyzed, the individuals in the sample showed good results in the WORC questionnaire, which identified that the factors that interfere with physical and psychosocial well-being are more influential in the first 24 months of surgery. However, in the functionality test it was observed that patients undergoing RC repair have a long-term deficit in functionality, even after undergoing rehabilitation.

Nevertheless, the longer the post-surgical time, the better the perception in relation to their psychosocial situation and physical well-being, showing that individuals tend to adapt to their current life condition. It is suggested that further studies be carried out as a larger sample to confirm and validate the data collected in the present study.

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