

## Quality of life and functionality in patients with rotator cuff disorders

## Qualidade de vida e funcionalidade nos pacientes com desordens do manguito rotador

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**RESUMO | OBJETIVO:** Verificar se existe correlação entre os domínios da qualidade de vida e a funcionalidade nos pacientes com desordens do manguito rotador. **MÉTODO:** Estudo do tipo transversal com 109 pacientes avaliados entre outubro 2013 e fevereiro 2014. Para avaliar a qualidade de vida foi utilizado o questionário WORC, e as escalas UCLA e ASES para avaliação da funcionalidade. **RESULTADO:** Amostra de 73 mulheres e 36 homens (média de idade: 52,3 anos+12,8). O ombro avaliado foi o direito em 63 pacientes (57,8%). O WORC apresentou correlação positiva alta com as escalas UCLA ( $r= 0,73$ ) e ASES ( $r= 0,77$ ). Ao analisar o WORC verificou-se correlação mais forte com a UCLA no domínio “Trabalho” ( $r= 0,74$ ), e menor no domínio “Esporte/Recreação” ( $r= 0,67$ ). Quando comparado o WORC com a ASES identificou-se a maior correlação com o domínio “Trabalho” ( $r= 0,79$ ) e menor correlação com o domínio “Emoções” ( $r= 0,64$ ). **CONCLUSÃO:** Alterações na funcionalidade, frequentes nestas desordens, impactam na qualidade de vida em especial no domínio “Trabalho”.

**PALAVRAS-CHAVE:** Manguito rotador. Qualidade de vida. Questionários. Escalas funcionais.

**ABSTRACT | OBJECTIVE:** To evaluate the correlation between different domains of quality of life and functionality in patients with rotator cuff disorders. **METHODS:** Cross sectional study with 109 patients evaluated between October 2013 and February 2014. The WORC questionnaire was used to evaluate quality of life, and the UCLA and ASES scales to evaluate functionality. **RESULTS:** The sample included 73 female and 36 males (mean age 52,3+12,8 years). The right shoulder was evaluated in 63 patients (57,8%). There was a high positive correlation between the WORC results and the UCLA ( $r= 0,73$ ) and ASES ( $r= 0,77$ ) scales. There was a stronger correlation between the WORC and the UCLA in the “Work” domain ( $r= 0,74$ ), and a weaker correlation in the “Sport/Recreation” domain ( $r= 0,67$ ). When comparing the WORC with the ASES scale, a higher correlation was identified with the “Work” domain ( $r= 0,79$ ) and a lower correlation with the “Emotions” domain ( $r= 0,64$ ). **CONCLUSION:** Alterations in functionality, frequent in RCD, have a considerable impact in the quality of life in special to the “Work” domain.

**KEYWORDS:** Rotator cuff. Quality of life. Questionnaires. Functional outcomes.

## Introduction

Shoulder pain is the third most common musculoskeletal pain, with a prevalence of approximately 47% in the general population. Among its causes, rotator cuff disorders (RCD) are outstanding as being the most frequent.<sup>1,2</sup> Symptomatic rotator cuff (RC) lesions present an incidence ranging from 4% to 32% and are more prevalent with advancing age, affecting over 50% of individuals older than 60 years<sup>3,4</sup>.

RCD has an important impact on the health and functionality of those affected by it. These lesions limit the capacity to practice sporting activities, or even activities of daily living (ADLs) that require lifting the arm above shoulder level<sup>5,6</sup>. Chronic pain is another constant component in patients affected by this disturbance causing physical and psychosocial effects. As a result of these factors, RCD is known to have the potential to cause human suffering and loss of quality of life (QoL) in persons affected by it<sup>1,2,7</sup>.

These disorders are treated by means of complex techniques of long duration that include physiotherapy, medications, and in more severe cases, surgical treatment plays a relevant role. Whatever the treatment may be, one of the main purposes is the elimination of pain and improvement in functionality of the shoulder<sup>8,9</sup>. Irrespective of the causes, severity or type of treatment, it is clear that a careful evaluation of the real impact of RCD is a key point for a correct diagnostic and therapeutic definition. This type of evaluation must include subjective aspects linked to the expectations of subjects, and not only evaluate the traditional clinical and radiological criteria<sup>10</sup>.

The scope of some studies has included the analysis of the functional results of treatment of RCD, however few studies have evaluated the QoL of these patients by using a questionnaire specifically for this disease; even rare are studies that have made some correlation between functionality and QoL<sup>11-12</sup>. Generic questionnaires may commonly be used for the evaluation of QoL in orthopedic conditions, but are poor for measuring the clinical changes resulting from specific joint diseases on the QoL of patients<sup>13,14</sup>.

Therefore, the aim of this study was to verify whether there was correlation between health-related quality of life and functionality of the shoulder joint in patients with RCD, by means of questionnaires specifically for the shoulder.

## Materials and methods

### Design/Subjects

A study with a cross-sectional design was conducted with a non-probabilistic sample of the sequential type. The subjects were evaluated in the period from October 2013 to February 2014 at the Physiotherapy Service of the "Promédica Group", Salvador – Bahia – Brazil.

For the purpose of estimating the sample size, the present study was based on study of Kirkley et al. (2003) who estimated the correlation between WORC and ASES at 0.70. Therefore, considering an alpha of 0.05 with detectable difference of 10%, the study required 81 subjects. A further 17 individuals were added to the estimated value to compensate possible losses. The estimated sample size was therefore a minimum of 98 individuals<sup>12</sup>.

### Ethical Considerations

All the patients who accepted participating in the research signed the term of free and informed consent, and the research project was approved by the Research Ethics Committee of the Bahian School of Medicine and Public Health, September 30th, report No.: 410.457 (Coordinator: Roseny Ferreira)

### Inclusion Criteria

Patients older than 18 years, who presented clinical diagnosis of RCD, such as the impingement syndrome (IS); calcific tendinitis or rupture of the RC tendons, with longer than 3 months of symptoms in the shoulder were included.

### Exclusion Criteria

Subjects with a history of radiological and symptomatic osteoarthritis of glenohumeral or

acromioclavicular joints, rheumatoid arthritis, cervicobrachialgia, cognitive disorders, neurological diseases or fractures that affected the shoulder, adhesive capsulitis, and those who were submitted to some surgical procedure in the shoulder were excluded.

### Data and Outcome Measurements

Two trained and qualified evaluators assessed the patients individually one at a time for application of the research instruments. The sociodemographic and clinical questionnaire was used containing the following items: age, sex, marital status, dominance, affected member(s), evaluated member, mechanism of lesion, onset of symptoms, educational level, profession, occupation, religion, smoking, previous pathology, physical activity, complementary exams and name of the assistant physician.

When the pain presented bilaterally, the shoulder evaluated was chosen by the patient as being the most painful or functionally limited, respecting the inclusion criteria. Afterwards, the patients were instructed to answer in a self-administered manner the instruments: Modified-UCLA (Modified-University of California at Los Angeles shoulder rating) scale, ASES (American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form) scale and WORC (Western Ontario Rotator Cuff Index) questionnaire for the assessment of functionality and quality of life.

The first functional scale to be applied was the Modified-UCLA. This instrument presents the score with five different weights for the five domains: 1) pain (10 points); 2) function (10 points); 3) active forward flexion (05 points); 4) strength of forward flexion (05 points) and 5) overall satisfaction (05 points), totaling 35 points. The score was classified as follows: 34-35 points corresponded to excellent, 28-33 good, 21-27 reasonable and 0-20 poor results<sup>15,16,17</sup>.

The second functional scale used was the ASES, that presents an item related to pain, evaluated by means of a VAS (Visual Analog Scale) (10 cm), which ranges from no pain (0) to the worst possible pain (10), and another item related to function<sup>18,19</sup>.

The items for function were evaluated by means of a Likert scale of four points, with questions related to routine activities that form part of the daily living of the majority of persons. The pain and function scores were transformed into percentages, each one represented 50% of the final score of the test, and could vary from 0 (no functionality) to 100 (normal functionality)<sup>18</sup>. To calculate the subsection pain, the pain score (maximum of 10) was multiplied by 5, totaling the maximum value of 50. For the subsection function, the sum of the function scores (maximum of 30) was multiplied by 5/3, presenting a maximum value of 50. The final calculation was tabled, with the subsections pain and function being added together, presenting the maximum value of 100<sup>15,16</sup>.

For the QoL assessment, the specific questionnaire for RCD (WORC) was applied. This instrument comprises 21 items distributed among five life and health domains: 1) physical symptoms (6 items); 2) sport/recreation (4 items); 3) work (4 items); 4) lifestyle (4 items) and 5) emotions (3 items). For each item a model similar to the VAS is used, with a line measuring 10.0 cm, with the score ranging from 0 to 100 [11,20]. Measurement of the distance from the left extremity of the marking line made by the patient was calculated, presenting a maximum value of 100 points for each item (recorded up to the nearest 0.5 mm), totaling 2100 points for the sum of the five domains.

Each domain may be calculated separately, with a final score able to range from 0 (without reduction in QoL) to 2100 (worst possible score in QoL).<sup>21</sup> To make the final result of this instrument more understandable, the authors of the original version of WORC recommend that the data should be converted to a score in percentage. This value in points was therefore transformed into percentage. The same procedure was applied for each domain, with the final result expressed in percentage ranging from 0 (the lowest level of QoL) to 100 (the highest level of QoL)<sup>12,15,21</sup>.

### Statistical Analyses

The results of the continuous variables were presented in the form of mean  $\pm$  standard deviation or median and interquartile amplitude according to the distribution. The categoric variables were

expressed as proportions. The measures of central tendency and dispersion were used to analyze the quantitative variables, and absolute and relative frequencies for the qualitative variables.

The Spearman test was used to calculate the coefficient of correlation between the QoL questionnaire and the functional scales. The choice of this test was based on the fact that the variables did not obey normal distribution. The correlations were considered as follows: a) between 1 and 0.90 (very high correlation); b) between 0.90 and 0.70 (high correlation); c) between 0.70 and 0.40 (moderate correlation); d) between 0.40 and 0.20 (low correlation); e) between 0.20 and 0 (very low correlation)<sup>22</sup>. To verify differences between the

groups, in all cases, the level of significance of 5% ( $p < 0.05$ ) was adopted.

## Results

A total of 109 patients were evaluated, among whom the most frequent clinical diagnosis was rotor cuff syndrome, accounting for 72.5%. As regards physical activity, the results showed that the majority of subjects did not perform any physical activity, and walking was outstanding as the most used exercised among those who practiced physical activity. Details of the remaining sociodemographic characteristics may be observed in Table 1.

**Table 1.** Sociodemographic characteristics of the 109 patients evaluated in the period from October 2013 to February 2014 at the Physiotherapy Service of the "Promédica Group", Salvador-Bahia-Brazil.

Variables	N	%
Age (Years) <sup>1</sup>	52.3 ± 12.8	
Sex (Women)	73	67.0%
Marital status (with partner)	58	53.2%
Education level		
Basic	21	19.3%
Medium	56	51.4%
Superior	32	29.4%
Physical activity	45	41.3%
Occupation		
Non workers' compensation	69	63.3%
Workers' compensation	11	10.1%
Retired	23	21.1%
Other	6	5.5%

<sup>1</sup> Results expressed in mean and standard deviation.

In spite of the right shoulder being the most compromised member (57.8%), the results of this study showed bilateral pain was present in 33.9% of the subjects evaluated. Table 2 presents the main characteristics of the lesions in the individuals assessed in this study. When analyzing the QoL questionnaire, it was found that the domains "Sport/Recreation" and "Work" presented the lowest mean values in QoL when compared with the remaining domains (Table 3).

**Table 2.** Clinical characteristics of the 109 patients evaluated in the period from October 2013 to February 2014 at the Physiotherapy Service of the “Promédica Group”, Salvador-Bahia-Brazil.

<b>Variables</b>	<b>N</b>	<b>%</b>
Duration of the symptoms (Month) <sup>1</sup>	28.7 ± 46.1	
Dominant member (Right)	103	94.5%
Evaluated member (Right)	63	57.8%
Mechanism of lesion (Traumatic)	55	50.5%
Complementary exams <sup>2</sup>		
Ultrasound	68	63.5%
Magnetic resonance	44	41.1%
Ray-x	17	15.9%
Types of the lesion <sup>3</sup>		
Tendinopathy without RC rupture	55	51.9%
Partial or complete RC rupture	40	37.7%
Calcific without RC rupture	9	8.5%
Calcific + RC rupture	2	1.9%

<sup>1</sup> Results expressed in mean and standard deviation / <sup>2</sup>N= 107 / <sup>3</sup>N= 106

**Table 3.** Results of the scales and questionnaire applied in the 109 patients evaluated in the period from October 2013 to February 2014 at the Physiotherapy Service of the “Promédica Group”, Salvador-Bahia-Brazil

<b>Outcomes measure</b>	<b>Mean</b>	<b>SD</b>
Total WORC <sup>1</sup> (0 - 100)	47.7	27.8
Physical symptoms	56.0	27.5
Sport / Recreation	40.6	29.6
Work	41.6	30.5
Lifestyle	51.5	33.0
Emotions	48.7	36.5
UCLA <sup>2</sup> (2 - 35)	20.5	7.0
ASES <sup>3</sup> (0 - 100)	52.1	20.2
VAS <sup>4</sup> (0-10)	5.1	2.4

<sup>1</sup> Western Ontario Rotator Cuff Index / <sup>2</sup> Modified-University of California at Los Angeles Shoulder Rating Scale / <sup>3</sup> American Shoulder and Elbow Surgeons Scale / <sup>4</sup> Visual Analog Scale  
Results expressed in mean and standard deviation.

The quality of life evaluated presented high positive correlation with the UCLA and ASES scales. When analyzing WORC, stronger correlation with UCLA was found in the domain “Work” and lower correlation in the domain “Sport/Recreation”. When WORC was compared with the ASES scale, greater correlation was identified with the domain “Work” and lower correlation with the domain “Emotions”. From the results found, the coefficient of correlation between the instruments that evaluated QoL and functionality was calculated (Table 4).

**Table 4.** Spearman's correlation (r) between WORC, UCLA and ASES in the 109 patients evaluated in the period from October 2013 to February 2014 at the Physiotherapy Service of the "Promédica Group", Salvador-Bahia-Brazil.

<b>WORC</b>	<b>UCLA</b>	<b>ASES</b>
Physical symptoms	0.71	0.76
Sport/Recreation	0.67	0.68
Work	0.74	0.79
Lifestyle	0.72	0.78
Emotions	0.68	0.64
Total WORC	0.73	0.77

All significant at  $p < 0.001$

## Discussion

The results of the present study showed significant high correlation between the majority of the quality of life domains with functionality of the shoulder in patients with RCD. This correlation was stronger for the domains Work and Lifestyle, while the domain Emotions presented the lowest correlation.

These results corroborate the findings of two other studies that tested the correlation between these functional scales and the quality of life questionnaire, WORC<sup>17,18</sup>. Kirkley et al. (2003) tested the WORC questionnaire with different functional scales and found greater correlation with ASES ( $r = 0.76$ ) followed by UCLA, which was outstanding with high correlation ( $r = 0.72$ )<sup>12</sup>. López et al. (2008) evaluated 100 patients with diagnosis of RCD (tendinopathy, RC lesion and those over 3 months after undergoing surgery) and found high correlation between quality of life and functionality, measured by means of UCLA ( $r = 0.80$ ,  $p < 0.001$ )<sup>20</sup>. The present study also presented high correlation between function and QoL, however it differed from that the cited authors, because it presented sectioned analysis correlated to functionality (UCLA and ASES) with the different quality of life domains of the WORC questionnaire.

When analyzing the "Work" domain, this presented the strongest correlation among the functional scales, and together with the Sport/Recreation domain, the lowest mean value among the QoL domains. This may be justified considering that RCD has been shown to present the second highest incidence of pain in the work environment, being surpassed only by pathologies of the spine. It substantially affects productivity at work, with the indication of high rates of workers' compensation and costs attributed to RC lesions in the work environment<sup>23</sup>.

In addition, these disorders are considered the second most frequent reason for absenteeism among manual workers, causing great loss in work, particularly in activities that involve frequent manipulation of loads, or with high force, and lifting above shoulder level<sup>23-24</sup>. These factors may justify the great impact of this domain on the studied population, considering that the majority of the subjects evaluated were not laid off work, and performed manual activities, particularly in occupations such as housework and teaching activities.

High work demands are associated with IS, however the association between this syndrome and psychosocial factors differed in some studies. The majority of studies used the cross-sectional type of design. This type of study does not favor the understanding of this association, therefore it is necessary for other studies with prospective designs to be conducted, so that this association may be confirmed<sup>24,25</sup>.

Inadequate treatment of painful conditions in patients with shoulder pain may create a vicious circle of persistent perception of pain, alterations in sleep patterns, symptoms such as depression and anxiety, as well as cognitive, behavioral and emotional changes<sup>26</sup>. Researchers have suggested that the prevalence of psychological symptoms is greater in patients with chronic pain than in the general population, and in patients with other pathologies without chronic pain. Cho et al. (2013) conducted a study with 130 patients with shoulder pain, 96 of whom were diagnosed with RCD, presenting pain for a minimum of 3 months and treated conservatively. The results of this study revealed a higher prevalence of symptoms of anxiety, depression and changes in sleep patterns in patients with RCD, showing evidence of the negative interference in the quality of life of patients<sup>26</sup>.

In the present study, the domain "Emotions" of the QoL questionnaire was used to measure these emotional and psychological changes. The results confirmed the hypothesis that there was correlation between pain and the emotional state, however, the domain "Emotions" was the one that presented the least intense correlation with the ASES scale, and together with the Sport/Recreation domain, with the UCLA scale. The force of this correlation may have been underestimated because functional scales did not present questions involving emotional aspects.

The domain "Physical Symptoms" should present a greater decrease in QoL because it has a greater association with the pain symptom. Whereas, in our results "Physical Symptoms" was the variable with the highest mean value in the WORC questionnaire. This fact is apparently in opposition to studies that point out that patients with RCD typically suffer from pain, weakness and limitation of movement, with pain being considered their main symptom<sup>1,6,27,28</sup>.

The severity and duration of symptoms are supposed to be related to worse QoL, representing a considerable negative impact on the functionality of subjects with these disorders. However, an American study that evaluated 433 individuals with complete RC lesion verified there was no correlation between the time of symptoms and the different measurement instruments used, among them ASES and WORC. In addition there was no statistically significant correlation with the severity of pain and RC lesion, muscle strength and ADM<sup>29</sup>.

The absence of studies in the literature which show statistically significant correlation between pain and severity of the RC lesion may be justified by histological results. These results revealed that the pain related to RCD appears to be associated with stimulation of the free nerve endings present in greater number in the bursa, followed by the tendon of the biceps and joint capsule. Although tendons play a role in the generation of pain, these structures have few free nerve endings, which justifies the hypothesis of an indirect mechanism by some peptides, or transmitters in initiating a response to pain by the fibers of the bursa, biceps or joint capsule<sup>30</sup>.

In spite of the causes related to RCD being multifactorial, the practice of sports and work involving repetitive movements of raising the arm above shoulder level, as well as excessive load are cited in diverse studies as the great factors responsible for the appearance of these disorders. In this study, a high frequency of sedentary subjects was found, and those that practiced some physical activity (walking) did not make movements that required the upper limb. However, there is a body of evidence that sedentarism may contribute to the appearance of these disorders, because muscle weakness and imbalance among the combined forces (deltoid muscles, RC and scapular stabilizers) are predisposed to subacromial impingement with consequent loss of function<sup>3,4,6</sup>.

The cross-sectional design was one of the limitations of the present study, making it impossible to affirm a cause-effect association among the variables. Another limitation was the non-probabilistic sampling of the sequential type, which may have diminished the validity of the study. In spite of these limitations, identifying the domains of QoL that presented the highest correlation with functionality may have contributed to the production of prospective studies that evaluate the associated factors and the development of preventive measures for these disorders. As the strong aspect of this study, the use of the questionnaire specifically for the disease, and functional scales specifically for the joint applied frequently in clinical practice, is pointed out.

## Conclusion

The authors concluded there is statistically significant correlation between functionality and quality of life of patients with RCD. The domain "Work" was outstanding as the strongest correlation and the domain "Emotions" was the one that presented the least intense correlation.

## Author contributions

Albuquerque RA participated in the conception, data collection, statistical analysis of the research data, interpretation of the results and writing of the scientific article. Castro MMC participated as supervisor, in the statistical analysis of the research data, in the interpretation of the results and in the writing of the scientific article. Matos MA participated in the study conception, interpretation of the results and writing of the scientific article. Daltro C participated in the statistical analysis of the research data and interpretation of the results.

## Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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