Functional scores are primarily related to muscle morphology and strength and less to osseous anatomy in rotator cuff pathologies and healthy controls

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Summary

We examined the relationship between functional scores, osseous parameters, and muscle morphology and strength in shoulders with rotator cuff pathology and healthy controls and found moderate correlations between functional scores and fat fraction (negative) and muscle strength (positive). Hence, functional scores reflect muscle composition and strength better than anatomical variations. Incorporating fat fraction analysis and strength measurements into shoulder pathology evaluations may help optimize treatment strategies.

Introduction

More than one-third of the population over the age of 60 is affected by rotator cuff pathology [1] and experiences shoulder pain, reduced range of motion, muscle weakness and lower functional scores [2]. An increased risk of rotator cuff tears has been attributed to history of trauma, dominant arm, and several anatomical parameters, including the critical shoulder angle, the greater tuberosity angle, and the subacromial space [3]. We aimed to assess the relationship between functional scores, osseous parameters, and muscle morphology and strength in shoulders with rotator cuff pathology and healthy shoulders.

Methods

Twenty-five patients with unilateral rotator cuff tears (mean ± standard deviation, age: 64.3 ± 10.2 years; body mass index (BMI): 26.5 ± 5.0 kg/m²), 25 asymptomatic subjects (age: 55.4 ± 8.2 years; BMI: 25.2 ± 4.6 kg/m²) and 25 healthy subjects (age: 26.1 ± 2.3 years; BMI: 22.6 ± 3.0 kg/m²) participated in this study [4]. Functional scores (Constant Score (CS), Subjective Shoulder Value (SSV)), critical shoulder angle, subacromial space, muscle volume, and fat fraction of the rotator cuff muscles (from magnetic resonance imaging), and isometric muscle strength (dynamometry, abduction and internal/external rotation) were assessed in both shoulders of all participants (n=150 shoulders). Pearson's cross correlations between functional scores, osseous parameters, and muscle morphology and strength were evaluated (R<0.2 very low; 0.2≤R<0.4 low; 0.4≤R<0.6 moderate; 0.6≤R<0.8 strong; 0.8≤R<1.0 very strong; P<0.05).

Results and Discussion

Functional scores correlated moderately (negatively) with fat fraction and (positively) with isometric muscle strength, and isometric muscle strength correlated (negatively) with fat fraction (Figure 1). The highest proportion of variance explained was observed for the SSV by the fat fraction of the supraspinatus muscle (FF SSP, 47.6%). Very few and low correlations were found between functional scores and osseous parameters (Figure 1).

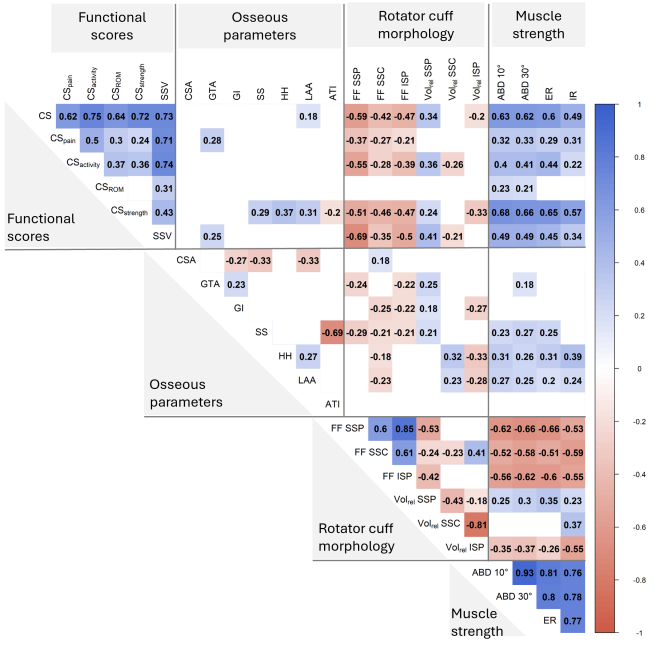

Figure 1: Correlation matrix between functional scores, osseous parameters, muscle morphology and strength (significant correlations only, P<0.05).

Conclusions

Functional scores with all functional subcomponents appear to reflect muscle composition and muscle strength but not osseous anatomical variations. Incorporating quantitative 3D fat fraction and comprehensive dynamometric muscle strength measurements of both abduction and rotation into the clinical evaluation of rotator cuff pathology would be valuable in further tailoring treatments, especially in cases where there is no clear evidence for a surgical treatment.

References

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