



## Original Article

# Evaluation of the acromiohumeral distance by means of magnetic resonance imaging umerus<sup>☆</sup>



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## ABSTRACT

**Objective:** To demonstrate the relationship between the size, degree of retraction and topography of rotator cuff injuries and the degree of rise of the humeral head, and to evaluate the influence of gravity, using magnetic resonance imaging (MRI).

**Methods:** We evaluated 181 shoulder MRIs from 160 patients aged over 45 years, between November 2013 and July 2014. The patients were divided into two groups: one control (no lesion or partial damage to the rotator cuff); and the other with complete tears of the rotator cuff. We measured the acromiohumeral distance in the sagittal plane, and established the shortest distance between the apex of the head and the acromion.

**Results:** In this study, 96 examinations on female patients (53.04%) and 58 on male patients (46.96%) were evaluated. The mean age was 63.27 years: in the control group, 61.46; and in the group with injuries, 65.19. From analysis on the measurements of the subacromial space, we observed significantly higher values in the control group (7.71 mm) than in the group with injuries (6.99). In comparing the control group with some specific subgroup, i.e. posterosuperior (6.77), anteroposterior-superior (4.16) and retraction Patte III (5.01), we confirmed the importance of topography and degree of retraction in relation to the rise of the humeral head.

**Conclusion:** The rise of the humeral head was directly related to the size, degree of retraction and topography of the rotator cuff injuries, with greater degrees of rise in cases of superior and posterior lesions and anteroposterior-superior (massive) lesions. The assessment using MRI was not influenced by the force of gravity.

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## Avaliação da distância úmero-acromial por meio da ressonância magnética

### R E S U M O

#### Palavras-chave:

Bainha rotadora  
Imagem de ressonância magnética  
Acrômio  
Úmero

**Objetivo:** Demonstrar a relação entre o tamanho, grau de retração e topografia das lesões do manguito rotador com o grau de ascensão da cabeça umeral e avaliar a influência da força da gravidade na ressonância magnética.

**Métodos:** Avaliamos 181 ressonâncias magnéticas de ombro de 160 pacientes com mais de 45 anos, entre novembro de 2013 e julho de 2014. Os pacientes eram divididos em dois grupos, um de controle (sem lesão ou com lesão parcial do MR) e outro com lesão completa do MR. Fizemos a mensuração da distância acrômio-umeral nos cortes sagitais e foi estabelecida a menor distância entre o ápice da cabeça e o acrômio.

**Resultados:** Foram avaliados neste estudo 96 (53,04%) exames de pacientes do sexo feminino e 58 de pacientes do sexo masculino (46,96%). A idade média foi 63,27 anos, a do grupo controle 61,46 e a do grupo com lesão 65,19. Ao analisar as medidas do espaço sub-acromial, observamos valores significativamente maiores no grupo controle (7,71 mm) do que no grupo com lesão (6,99). Quando comparamos o grupo controle com alguns subgrupos específicos, posterossuperior (6,77), anteroposterossuperior (4,16) e retração Patte III (5,01), confirmamos a importância da topografia e grau de retração para ascensão da cabeça umeral.

**Conclusão:** A ascensão da cabeça umeral tem relação direta com o tamanho, grau de retração e a topografia das lesões do manguito rotador, com graus maiores de ascensão nas lesões posterossuperiores e anteroposterossuperiores (extensas). A avaliação feita pela ressonância magnética não sofre influência da força da gravidade.

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## Introduction

The rotator cuff acts as a compressor of the head of the humerus against the glenoid, thus enabling shoulder movements in different spatial planes. Disease of the rotator cuff may cause this equilibrium to be broken and may culminate in more advanced stages of injury with consequent ascension of the humeral head.<sup>1-4</sup> This phenomenon can be quantified by measuring the distance from the humerus to the acromion.<sup>5</sup>

The mechanism for ascension of the humeral head is still not completely clear. It is believed that the traction exerted by the deltoid muscle without the stabilizing action of the rotator cuff might explain these findings.<sup>5</sup> In this regard, failure of the infraspinatus and the depressor function of the humeral head would allow ascension by means of an injured supraspinatus that would not occupy the subacromial space.<sup>6-9</sup>

Clinically, this measurement can be used to evaluate the function of the rotator cuff and aid in choosing the type of therapy to be used.<sup>10,11</sup> A distance from the humerus to the acromion of less than or equal to 7 mm measured on radiographs in anteroposterior view suggests that the rotator cuff injury is large, which diminishes the likelihood of successful surgical treatment.<sup>10,12</sup> It has also been shown that the ascension of the humeral head is related to fatty degeneration of the rotator cuff.<sup>11-13</sup>

Use of magnetic resonance imaging (MRI) for estimating the ascension of the humeral head is currently under great discussion. One of the main issues involved is the fact that MRI is performed in dorsal decubitus. It is believed that

the reduction of the force of gravity on the limb during the examination might overestimate this radiological finding.

The objectives of this study were: (1) to demonstrate that the degree of ascension of the humeral head is related to the size of the rotator cuff injury and its degree of retraction; (2) to evaluate whether the ascension of the humeral head on MRI has any relationship with gravity; and (3) to ascertain whether the location of the injury influences this ascension of the humeral head.

## Materials and methods

This study was approved by the Research Ethics Committee of our institution. Prospective evaluations were conducted on 181 MRIs of the shoulder, from 160 patients who underwent this examination between November 2013 and July 2014. These evaluations were performed in a radiology clinic.

For inclusion in this study, the patients needed to be more than 45 years of age and to have undergone MRI for investigation of non-traumatic pathological conditions of the shoulder. Patients with histories of fractures or previous surgery on the shoulder that was now undergoing examination, cases involving magnetic resonance arthrography and patients with glenohumeral arthrosis that had already become established were excluded.

The patients were divided into two groups. The first group did not present rotator cuff tears or only presented partial tears (control group). The second group, called the injury group, presented complete tears of the rotator cuff and was

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