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Original article

Analysis on the acromial curvature and its relationships with the subacromial space and types of acromion☆,☆☆

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ABSTRACT

Objective: To correlate the acromial curvature, using the angles proposed, with the subacromial space and types of acromion.

Methods: Ninety scapulas were studied. The acromia were classified as types I, II or III. The acromial curvature was analyzed by means of the alpha, beta and theta angles. We also measured the distance between the anteroinferior extremity of the acromion and the supraglenoid tubercle (DA). The scapulas were grouped in relation to sex and age. The angles proposed were analyzed in relation to each type of acromion and also in relation to the measurements of the distance DA.

Results: Out of the total number of acromia, 39 (43.3%) were type I, 43 (47.7%) type II and eight (9%) type III. The mean ages for each type of acromion (I–III) were 45.6, 55.2 and 51.1 years, respectively. The proportions of the different types of acromion varied in relation to sex and age. The evaluations on the mean beta angle ($p = 0.008$) and theta angle ($p = 0.028$), with comparisons in relation to each type of acromion and measurements of the distance DA ($p = 0.037$), were shown to be statistically significant.

Conclusion: The angles proposed in our study can be used for morphometric analysis on the acromion, especially regarding its curvature, and can contribute towards studies on diseases of the shoulder and aid in surgical planning and analysis of the acromial slope, by means of radiography or magnetic resonance.

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Análise da curvatura acromial e sua relação com o espaço subacromial e os tipos de acrômio

Palavras-chave:
Acrômio/anatomia & histologia
Síndrome de colisão do ombro
Bainha rotadora

RESUMO

Objetivo: Correlacionar a curvatura acromial, por meio dos ângulos propostos, com o espaço subacromial e os tipos de acrômio.

Métodos: Foram estudadas 90 escápulas. Os acrômios foram classificados em tipos I, II ou III. A curvatura acromial foi analisada por meio dos ângulos alfa, beta e teta. Mensuramos também a distância entre o extremo anteroinferior do acrômio e o tubérculo supraglenoidal (DA). As escápulas foram agrupadas em relação ao sexo e à idade. Os ângulos propostos foram analisados em relação a cada tipo de acrômio e também em relação à medida da distância DA.

Resultados: Do total de acrômios, 39 (43,3%) foram do tipo I, 43 (47,7%) do tipo II e oito (9%) do tipo III. A média de idade para cada tipo de acrômio I-III foi de 45,6 anos, 55,2 e 51,1, respectivamente. A proporção dos diferentes tipos de acrômio variou em relação ao sexo e à idade. A avaliação das médias dos ângulos β ($p = 0,008$) e θ ($p = 0,028$), comparadas em relação a cada tipo de acrômio e às medidas da distância DA ($p = 0,037$), mostrou-se estatisticamente significativa.

Conclusão: Os ângulos propostos no nosso trabalho podem ser usados para análise morfométrica do acrômio, em especial de sua curvatura, contribuir para os estudos das doenças do ombro e auxiliar na programação cirúrgica e na análise da inclinação acromial por meio de radiografia ou ressonância magnética.

Introduction

Studies on the morphology of the acromion have gained importance since Neer's work. Based on analysis on human cadavers and clinical observations, Neer described the impact syndrome (IS), an association between acromial morphology and a clinical entity characterized by repeated mechanical shocks caused by the rotator cuff in the subacromial compartment.[1]

Subsequently, other authors confirmed the association between the shape of the acromion and rotator cuff injuries (RCIs).[2–4] There is a great variety of shapes of the acromion in the population. Bigliani et al.[5] proposed a classification system for the acromion from a study on 140 shoulders from human cadavers. They identified three types of acromion: straight (type I), curved (type II) and hooked (type III). The more curved the acromion is, the greater the likelihood of diminished subacromial space, with consequent development of IS and RCIs.[5]

The classification system proposed by Bigliani et al.[5] has been greatly used to analyze the prevalence of each type of acromion in the population and its relationship with age.[6–8]

Although greatly used, the classification of the acromion into straight, curved and hooked types is a subjective concept, especially with regard to distinguishing acromion types II and III, and there is scope for wide interobserver variability.[9,10]

For this reason, some researchers have proposed using angles to understand the variation of the acromial curvature.[4,11] However, the traditional classification of Bigliani et al.[5] is still greatly used because it is easy to remember and to reproduce graphically, despite its subjectivity.

In the light of this situation, we created three angles in the present study, for correlation with the types of acromion. These would also provide an objective idea of the subacromial space. We measured the distance between the supraglenoid tubercle and the anteroinferior extremity of the acromion (DA), in order to understand the extent to which the acromial curvature is capable of interfering with this space and thus causing pinching of the structures included in this.

Materials and methods

This research project was approved by the Ethics Committee for Research Involving Human Beings of the Federal University of Sergipe, under protocol no. CAAE 0041.0.107.000-08. No free and informed consent statement was applied because this was a study on cadavers. The scapulas were obtained in accordance with Law 8501, of November 30, 1992, which makes provisions regarding the use of unreclaimed cadavers for the purposes of scientific studies or research.

Ninety scapulas from dry adult human skeletons were studied. These cadavers belong to the Human Anatomy Laboratories of Tiradentes University and the Federal University of Sergipe and are catalogued and identified in relation to sex and age. Among these 90 scapulas, 54 were from males and 36 were from females. The mean age was 51.9 years, ranging from 14 to 81.

The scapulas were grouped in relation to sex and age (≤49 years and ≥50 years).

The scapulas were digitized using an HP scanner (Deskjet F4180® model). The images were analyzed using the Image J 1.41 software (Wayne Rasband, Research Services