

Morphological Classification and Significance of the Acromion for the Shoulder Pathology

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The acromion is one of the two processes of the scapula. It plays a role in the field of orthopedics by having a correlation with some diseases. The morphology of this process has a significant role in upper limb pathology. The aim of the present study was to describe the different types of acromion process based on its morphology and to discuss its relation to some orthopedics diseases. We carried out a research which included 30 scapulae of unknown sex and age, provided by the Medical University of Sofia. Digital Vernier caliper and goniometer were used to calibrate the parameters (length, width etc.) of the process. We established three types of acromion process: type 1 – flat, type 2 – curved and type 3 – hooked. Our study showed that type 2 (curved) was the most commonly observed – around 80 % of the fixed materials; type 1 (flat) was seen in 11% and type 3 (hooked) – in 9%. People with type 3 (hooked) acromion process tend to suffer more often from the subacromial impingement syndrome. Knowledge of the morphology of the acromion process may help with the diagnosis and treatment of various diseases discussed in the present study and may supplement the work of shoulder surgeons and people occupied with this field of work.

Key words: acromion, morphology, scapula, orthopedics

Introduction

The scapula is a large flat bone with triangular shape that has three processes – spine, acromion and coracoid process [9]. The anatomy term “process” itself means a prominence on a bone. The acromion process projects forward from the lateral end of the spine of scapula at an approximately right angle [9]. It is larger than the other processes and articulates with the lateral end of the clavicle. The tendon of supraspinatus muscle passes under the process; furthermore, these two structures are separated by the subacromial bursa [8].

There are three main structures that create the so-called coraco-acromial arch - the anterior part of acromion process, the coraco-acromial ligament and the coracoid process [8]. The morphometry of the acromion and the measurements of the arch

have a significant role in the field of orthopedics, by having a correlation with some diseases [7]. In addition, it contributes to the medical treatment of the upper limb. The morphology of the acromion is mostly associated with the subacromial impingement syndrome which causes inflammation of the bursa situated under the acromion, thus leading to pain while abducting the upper limb in the shoulder joint [2, 5, 8].

The aim of the present study was to describe the different types of acromion process based on its morphology and to discuss its relation to some orthopedics diseases.

Materials and Methods

The present study was conducted on 30 adult human scapulae of unknown age and sex in the Department of Anatomy, Histology and Embryology, Medical University of Sofia, Bulgaria. The study was approved by the Medical Legal Office and Local Ethics Committee. The materials had been fixed and had undergone chemical processing for this study. Only bones with clear features that were intact were used while the unfit excluded. One structure that we didn't take under consideration was the glenoid notch located in the anterior margin of the glenoid cavity.

The measurements were taken with the help of a caliper and recorded in millimeters (mm). The following parameters were measured: length; width; thickness; acromio-coracoid (A-C) distance, which was the distance between the tip of the coracoid process and the acromion process; acromio-glenoidal (A-G) distance, representing the distance between the supraglenoid tubercle and the tip of the acromion process. The measurements were analysed by means of descriptive statistics including percentage, mean and standard deviation and were statistically evaluated through a T-test.

Results

In the present study, we reported the presence of three types of acromion process – type 1 – flat (**Fig. 1a**), type 2 – curved (**Fig. 1b**) and type 3 – hooked (**Fig. 1c**). These types were distinguished based on the extent of its arch. The obtained data showed that the maximum length of the acromion was 51 mm, the maximum width – 29 mm and the maximum thickness – 11 mm. The A-C distance and the A-G distance were 39 and 30 mm, respectively. We also calculated the mean values: length – 44 mm, width – 24.3 mm, thickness – 7.7 mm, A-C distance – 26.6 mm and A-G distance – 22.9 mm (**Table 1**). As a result, we concluded that type 2 (curved) was most commonly observed – around 80% of the fixed materials, followed by type 1 (flat) which was seen in 11%. Type 3 (hooked) represented only 9% of the scapulae.

Table 1. Numerical representation of the measurements of acromion

<i>Measurements</i>	<i>Mean values</i>	<i>SD</i>	<i>Min values</i>	<i>Max values</i>	<i>t-test</i>
Length (mm)	44.0	4.15	35	51	0.40
Width (mm)	24.3	2.33	19	29	0.46
Thickness (mm)	7.7	1.37	6	11	0.17
Acromio-coracoid distance (mm)	26.6	4.81	20	39	0.21
Acromio-glenoidal distance (mm)	22.9	3.41	16	30	0.02



Fig. 1. Photograph of different types of acromion: a) type 1 – flat; b) type 2 – curved; c) type 3 – hooked.

Discussion

Many studies have explored the morphometry of the acromion process, the different types of acromion and its correlation with the impingement syndrome [1, 3, 6]. It appears that most data reported in previous studies are comparable to our measurements and evaluations. Anetzberger and Putz observed that the mean acromial length was 47.00 mm [1]. In the present study, this parameter was calculated as 44 mm. Rarely, a fourth type is observed, in which case the acromion is concave in cranio-caudal direction [4]. This classification was proposed by Farley et al. [4] but has not been taken into consideration because of the rare occurrence of type 4 acromion and absence of correlation with rotator cuff pathology.

According to Epstein et al. [3], the acromion morphology appears to affect the success of conservative medical treatment in some cases and surgical procedures to people with orthopedic diseases. It appears that patients with the hooked type of acromion tend to suffer more often from the impingement syndrome [9]. This means that the anatomical features of the process have an effect on the pathology of the rotator in the arm joint. This hooked shape particularly tends to create pressure on the bursa which is situated under the process. This leads to pain while rotating the shoulder joint. Furthermore, the presence of enthesophytes is associated with acromion type III, and together they are mainly associated with subacromial impingement syndrome and injury of the rotator cuff [6]. Some of the parameters we examined vary with sex and age, which also has a clinical significance. Information about sex and age of the examined material, however, was unavailable and could not be assessed in the present study.

Conclusion

In the present study, we described the presence of 3 types of acromion process: flat (type 1), curved (type 2) and hooked (type 3), based on the extent of its arc. We found that the dominant type was type 2 (curved). People with type 3 (hooked) acromion process tend to suffer more from the subacromial impingement syndrome, because this shape tends to create pressure on the bursa which is situated under the process. The morphometric data on the acromion process and types of acromion may be helpful for the field of orthopedics during surgical repair around the shoulder joint.

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