

The Acromion and its Different Forms

El Acromion y sus Diferentes Formas

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SUMMARY: The morphology of the acromion, its relation to the coracoid process and the supraglenoid tubercle is important in the determination of the dimension of the subacromial space, considering that the variations of these structures can promote pathologies such as impingement syndrome of the subacromial space. There is little information on the different dimensions and forms of the acromion. We studied in 36 scapulae at the museum of the Anatomy Unit, Universidad de La Frontera, the following parameters: length, denseness, width, anterior projection, distance acromiocracoid and acromion supraglenoid. According to this form, the type was qualified in acromion type I (plane) type II (curved) and type III (hooked). The averages of the variable length, anterior projection were statistically significant in the acromion of the right side. In relation to its classification 8% was type I, 50% type II, and 42% type III. The anatomically obtained information will allow health professionals to access new morphometric information regarding the acromion and use it as a base for future pathology investigation of the upper arm.

KEY WORDS: Acromion; Morphometry; Anatomy.

INTRODUCTION

In the description of the acromion a superior rough surface is considered to be in direct relation with the skin and concave lower surface that covers the shoulder joint, the thick and rough external border, a thin internal border in which an oval surface is traced, which major diameter is anterosuperior directed to articulate with the clavicle, an extreme anterior in which the acromiocracoid ligament is inserted Testut & Latarjet (1971).

The variation of the acromion form has been studied by different authors as Bigliani *et al.* (1986), who classified the acromion in type I plane, type II curved, acromion type III hooked acromion.

According to Ikemoto (2005), the possibility of having a type III acromion is greater as the subject's age increases, allowing for speculation that a hooked form of the acromion is a degenerative process.

Variation in the form of the acromion has been associated with pathologies such as subacromial

impingement syndrome, defined as a painful process caused by the friction between the inferior surface of the anterior acromion, the coracoacromial ligament on the one hand, the subacromial bursa and the rotator cuff on the other. The form, size and above all the excessive anterior prominence of the acromion are the main factors involved in the origin of this injury, Neer (1972).

A study in 420 scapulae of cadavers performed by Nicholson *et al.* (1996), indicates that the primary morphology of the acromion does not change with age, and the distribution of the different types of acromion varies beginning at age fifty; there is a significant increase in the prevalence of spur formation beginning at age fifty.

Arenas *et al.* (2005) performed a retrospective form study of the clinical material of 87 cases of subacromial syndrome with rupture of the rotator cuff, conventional radiology supported that the form of type I acromion was of 4.7%, type II 51.76% and type III 43.52%. Epstein *et al.* (1993) indicate that acromion type III or hooked acromion

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were viewed with a frequency of two times greater in patients with impingement syndrome of the rotators, in addition to the presence of this type of acromion in an MRI, could help identify those individuals at risk of developing impingement or rupture of the rotators.

The objective of the present study was to determine the morphology of the acromion with the aim of establishing different forms according to the Bigliani classification as well as to determine the different dimension in relation to the length, width, denseness anterior projection and relation with adjoining structures, such as supraglenoid tubercle and coracoid process.

MATERIAL AND METHOD

The material used in this investigation corresponded to 36 scapulae (16 right and 20 left) of adult subjects from the Museum of the Anatomy Unit, Faculty of Medicine, Universidad de La Frontera, Temuco, Chile. With a digital paquimeter and a metric precision tape the following measurements and observations of the acromion were obtained: length, width, denseness, anterior projection, distance between the acromion and coracoid process, between acromion and supraglenoid tubercle, additionally the shape of the surface of the inferior surface and lateral aspect of the acromion were observed in order to realize its classification. Each one of these measurements and observations were performed by two investigators, three times in separate times tabulating the average of said measurement. The T test was performed for non-parametric samples with the SPSS 13. program.



Fig. 1. Type 1 acromion according to Bigliani classification.



Fig. 2. Type 2 acromion according to Bigliani classification.

RESULTS AND DISCUSSION

The results of the shape of the acromion and its different dimensions demonstrate that in the scapulae studied, the acromion type I presented in 8%, of type II in 50%, and in type III in 42%, indicating a greater presence of acromion type II in the population studied, according to studies performed by Getz *et al.* (1996); Shah *et al.* (2001); Natsis *et al.* (2007); Oda *et al.* (2000); Paraskevas *et al.* (2008), whose investigation was carried out in macerated scapulae through visual inspection, the classification method carried out through images, also indicate a greater percentage of this type of acromion, even in those cases where authors as Shipinger *et al.* (1997), Wang *et al.* (2000), in their research found a greater percentage of acromion type I and II.

In the morphometric evaluation of the acromion according to studies by Paraskevas *et al.*, the average width was 22.3mm (19-28), denseness of 8.8mm (7-11), length 46.1mm (38-55). In our study the width of the acromion was 24.5mm, denseness 8.5mm and average length was 65.8mm. We could assume that the difference in relation to the length was because the measurement in our study was taken from the most anterior point of the apex acromion, to the base formed by the expansion of the spine scapulae.

The acromion morphology according to Epstein *et al.*, appears to have a prediction value to determine the success of conservative medical treatment in some cases and

Table I. Mean values in millimeters of right and left acromion in scapulae of the museum of adult individuals. Anatomy Unit, Universidad de La Frontera, Temuco, Chile.

	Right scapulae		Left scapulae	
	X (mm)	DS	X	DS
Length	69.12	3.5	63.15	7.1
Thickness	8.73	0.8	8.42	1.0
Width	25.12	1.8	24.12	2.9
Anterior projection	46.84	3.3	41.73	5.9
DistanceA-PC	39.76	5.2	39.55	5.4
Distance A-TS	28.24	2.7	28.43	2.7

Table II. T test applied to the variables studied in the acromion in scapulae of the museum of adult individuals. Anatomy Unit, Universidad de La Frontera, Temuco, Chile.

Variables	Average			T Value
	Right	Left		
Length	69.12	63.15		0.004
Width	25.12	24.12		0.2
Thickness	8.73	8.42		0.3
Projection	46.84	41.73		0.003
Acrocoracoides	39.76	39.55		0.9
Acromio supraglenoideo	28.24	28.43		0.8

Table III. Types of acromion and distribution in the literature.

	Classification method	Type I, %	Type II, %	Type II, %
Bigliani <i>et al.</i> (1986)	Radiography	18.6	42.0	38.6
Morrison <i>et al.</i> (1987)	Radiography	18.0	41.0	41.0
Epstein <i>et al.</i> (1993)	MRI	43.0	45.0	13.0
Toivonen <i>et al.</i> (1995)	Radiography / MRI	5.4 / 14.3	62.5 / 62.5	32.1 / 23.2
Getz <i>et al.</i> (1996)	Visual Inspection	22.8	68.5	8.6
Nicholson <i>et al.</i> (1996)	Radiography	32.0	42.0	26.0
Schippinger <i>et al.</i> (1997)	MRI	67.7	32.3	0.0
Wang <i>et al.</i> (1997)	Radiography	40.8	44.9	14.3
MacGillivray <i>et al.</i> (1998)	M R I	40.0	52.0	8.0
Oda <i>et al.</i> (2000)	Visual Inspection	34.0	50.0	16.0
Wang <i>et al.</i> (2000)	Radiography / MRI	6.0 / 6.0	66.0 / 69.0	28.0 / 25.8
Shah <i>et al.</i> (2001)	Visual Inspection	17.0	83.0	0.0
Speer <i>et al.</i> (2001)	Radiography	11.5	84.5	4.0
Hirano <i>et al.</i> (2002)	MRI	36.3	24.2	39.6
Worland <i>et al.</i> (2003)	Radiography	7.6	50.0	42.4
Arenas <i>et al.</i> (2005)	Radiography	4.7	51.7	43.5
Ikemoto <i>et al.</i> (2005)	Radiography	29.1	50.5	20.4
Mayerhoefer <i>et al.</i> (2005)	MRI	10.7	82.1	7.1
Sangiampong <i>et al.</i> (2006)	Radiography	3.2	93.5	3.2
Natsis <i>et al.</i> (2007)	Visual Inspection	12.1	56.5	28.8
Paraskevas <i>et al.</i> (2008)	Visual Inspection	26.1	55.6	18.1
Collipal <i>et al.</i> (2009)	Visual Inspection	8.0	50.0	42.0

the need for surgery in patients with joint impingement. Acromion of the hook type were observed with two times greater frequency in patients with rotator cuff impingement syndrome.

The anatomical characteristics of the acromion are related to the pathology of the rotator cuff, the presence of enthesophytes is associated with acromion type III, and together they are particularly associated with subacromial impingement syndrome and injury of the rotator cuff (Natsis *et al.*).

The anatomy of the acromion and related structures in the shoulder joint is of importance and useful to successfully carry out interpretation of images and surgical procedures in pathologies associated with this joint.

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La morfología del acromion, sus relaciones con el proceso coracoides y tubérculo supraglenoideo es importante en la determinación de la dimensión del espacio subacromial, considerando que las variaciones de estas estructuras pueden provocar patologías como el síndrome del pinzamiento del espacio subacromial. Para aportar información de las diferentes dimensiones y forma del acromion, hemos estudiado en 36 escápulas del museo de la Unidad de Anatomía, Universidad de La Frontera, los siguientes parámetros: longitud, espesor, ancho, proyección anterior, distancia acromiocracoidea y acromio supraglenoidea. De acuerdo a su forma se clasificaron en acromion tipo I (plano), tipo II (curvo), tipo III (ganchoso). Los promedios de las variables longitud, proyección anterior, fueron estadísticamente significativas en el acromion del lado derecho. En relación a su clasificación, el 8% fue de tipo I, 50% tipo II, 42% tipo III. Los datos anatómicos obtenidos permitirán a los profesionales de la salud contar con nuevos antecedentes morfométricos del acromion pudiendo servir de base para futuros estudios de patologías del miembro superior.

PALABRAS CLAVE: Acromion; Morfometría; Anatomía.

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