

# SEXUAL DIFFERENCES IN SEVERAL SKELETAL OCCUPATIONAL MARKERS IN THE GUANCHE POPULATION OF THE NORTHERN SLOPE OF TENERIFE

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**Abstract.** In 1998, in the locality of Mesa del Mar (municipality of Tacoronte, northern slope of the island of Tenerife, Canary Islands), a Guanche funerary site was dugged up. This site, dated in the 10<sup>th</sup> century AD, was located in a cave, on the top of a coastal cliff, and was composed of the skeletal remains of a minimum of 36 individuals of both sexes. An analysis of these remains, compared to

other remains from two other sites of similar characteristics (Cueva de La Lana and Cueva del Guanche) seem to suggest, after analyzing the changes in the cervical vertebral bodies and the presence of occupational stress markers in clavicles and scapulae, the presence of intersexual differences compatible with differences in the type of work performed by the aboriginal population.

**Keywords.** Cervical vertebrae. DJD. Clavicle. Occupational stress markers. Guanches.

## I. INTRODUCTION

In 1998, in Mesa del Mar, in the municipality of Tacoronte (northern slope of the island of Tenerife), an ancient Guanche burial cave was discovered on a coastal cliff. This burial, dated approx. in the 10<sup>th</sup> century of our era, shows a series of unique characteristics such as having remained almost unchanged until its discovery and having been excavated following a scientific archaeological method, with all the biological material extracted, which gives an accurate idea on taphonomic processes.

## 2. MATERIAL AND METHODS

The main characteristic of the skeletal remains found in this site is its high state of fragmentation and deterioration. As a consequence of the state of fragmentation of the remains, there are few bones showing anatomical connection.

The skeletal remains of the site are grouped into eleven sectors or grids. Two of them correspond to the outer cornice of the cave and the remaining nine cover the interior:

The total number of bone fragments collected exceeded 10,000 fragments.

The state of fragmentation in which the bones were found makes very complicated to establish what is the minimum number of individuals. Therefore, the determination of the minimum number of individuals was carried out by the partial reconstruction of the skulls.

In view of the large amount of remains found, this work is limited to show the preliminary results related to vertebrae and scapular waist (scapulae and clavicles) of the individuals present in the site and compared, when possible, with data obtained from burials of similar characteristics (Cueva del Guanche -Tegueste- and Cueva de La Lana -next to the cave we study).

The measurement of the length of the bones was made using osteometric tables and calipers.

The study of the presence of occupational stress markers was evaluated according to Capasso (1999) and Estévez-González (2004).

For this study, we discard all the infantile remains.

### 3. RESULTS

#### 3.1. Minimum number of individuals, sex and age

Attending to the partial reconstruction of the skulls, it was possible to verify the presence in the site of forty-one individuals (41):

- Thirteen are adults over thirty
- Nine belong to young adults between the ages of sixteen and thirty
- Five are from young people under sixteen
- Fourteen with indeterminate ages

The state of fragmentation of the bones and the fact that they were not, for the most part, in anatomical connection made it impossible to determine the sex of the individuals through the analysis of the pelvis, so it was determined through the cranial characteristics.

Thus, in the burial we found the presence of:

- Eleven male individuals
- Ten female individuals
- Fifteen individuals of indetermined sex

#### 3.2. Vertebrae

The total number of vertebrae (sacral and coccygeal vertebrae are not included in the study) and vertebral fragments collected was higher than 1000, of which:

- 142 have a degree of integrity above 75%
- 100 have a degree of integrity between 25 and 50%
- 26 have a degree of integrity less than 25% but retain some individualizing feature.
- The rest (approximately 800 fragments) do not provide data due to their small size or lack of individualizing information.

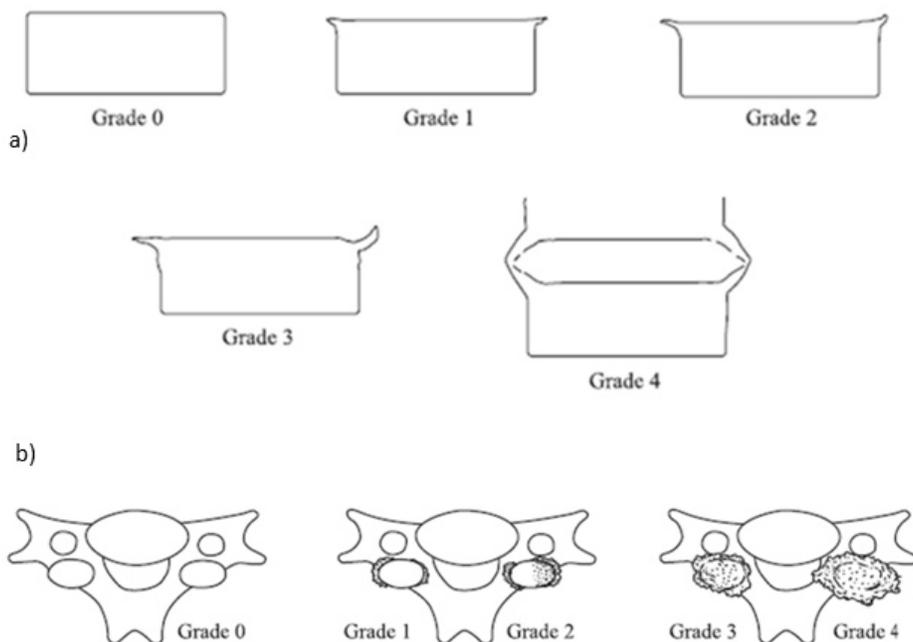
The vertebrae present in the burial have a different degree of integrity, being able to keep four, three, two, one or zero apophyseal joint surfaces (Table 1).

The fact of the presence in the site of a proportion of thoracic vertebrae much lower than expected is noteworthy. Approximately 33.7% of the total vertebrae found versus the 50% that would be expected if the natural proportion were maintained.

The osteophytic changes in the vertebral bodies were classified in five degrees, according to the classification of Rogers (1966) and Wada (1975), updated by Shi-

moda (2012). This classification is based on the progressive appearance of osteophytes in the vertebral body (Fig. 1). Thus, we can set the following degrees:

- Grade 0: normal condition
- Grade 1: horizontal growth
- Grade 2: growth in vertical direction
- Grade 3: significant growth in vertical direction
- Grade 4: bridging with adjacent vertebrae.



**Fig. 1.** (a) Progressive stages of osteophytes on the body of vertebrae. Grade 0: normal condition; Grade 1: horizontal growth; Grade 2: growth in vertical direction; Grade 3: significant growth in vertical direction; Grade 4: bridging with adjacent vertebrae. Redrawn from Shimoda (2012).

(b) Progressive stages of degenerative change of apophyseal joint surface. Grade 0: normal condition; Grade 1: osteophyte growing on the rim of articular surface without pitting; Grade 2: osteophyte growing on the rim of articular surface with lipping and slight pitting; Grade 3: osteophyte growing all around the rim of articular surface with moderate pitting; Grade 4: osteophyte significantly growing with severe pitting and unclear rim. Redrawn from Shimoda (2012).

It was also considered another grade consistent in the category 4 accompanied by flattening of the vertebral disc.

The study of the degree of DJD in the vertebral apophyseal joint surfaces was evaluated according to Shimoda (2012), setting five degrees:

- Grade 0: normal condition.
- Grade 1: osteophyte growing on the rim of articular surface without pitting.
- Grade 2: osteophyte growing on the rim of articular surface with lipping and slight pitting.
- Grade 3: osteophyte growing all around the rim of articular surface with moderate pitting.
- Grade 4: osteophyte significantly growing with severe pitting and unclear rim.

The results obtained at Mesa del Mar burial are shown in Table I.

**Table I.** Number of vertebrae present in the funerary site of Mesa del Mar indicating the number of apophyseal joint surfaces, the number of vertebrae with changes in their bodies and the percentage of apophyseal joint surface according to their degree.

	Total number of vertebral arches present		Number of apophyseal joint surfaces					
			0	1	2	3	4	
Cervicals	112		28	16	20	7	41	
Thoracics	86		22	9	9	9	37	
Lumbar	57		14	8	9	2	24	
	Total number of vertebral bodies present		Number of vertebrae with changes in their bodies according to their degree					
			0	1	2	3	4	4 + flattening
Cervicals	112		12	44	14	15	16	12
Thoracics	82		4	56	5	6	11	0
Lumbar	43		2	25	7	6	3	0
			% of apophyseal joint surfaces with DJD according to their degree					
			0	1	2	3	4	
Cervicals			35,9%	43,5%	9,3%	7,2%	4,1%	
Thoracics			29,5%	53,0%	9,5%	2,5%	5,5%	
Lumbar			14,5%	62,6%	11,5%	3,0%	8,4%	

### 3.3. Scapulae

The number of scapulae present in the site of Mesa del Mar is distributed in a total of 94 fragments that, in general, present a high degree of fragmentation. Only eleven of these fragments conserve the glenoid cavity.

Due to this low number of scapulae with glenoid cavity, the DJD degree was also studied in two other burials of similar characteristics: Cueva de la Lana, located on the same cliff as Mesa del Mar, and Cueva del Guanche (Tegeste).

For this, in a similar way to the vertebral joints, five degrees of DJD were established for the glenoid cavity and for the acromio-clavicular joint. The results are shown in Table 2.

There are two cases of osteochondritis in six of the glenoid cavities that remain complete.

**Table 2.** Percentage of DJD in the scapular and clavicular joints.

SCAPULAE		percentage of DJD in the glenoid cavity according to its degree				
		0	1	2	3	4
	Mesa del Mar	45,5 %	36,4 %	0	18,1 %	0
	Cueva de la Lana	33,3 %	50,0 %	16,7%	0	0
	Cueva del Guanche	40,0 %	40,0 %	13,3 %	6,7 %	0
SCAPULAE		percentage of DJD in the acromio-clavicular joint according to its degree				
		0	1	2	3	4
	Mesa del Mar	0	100 %	0	0	0
	Cueva de la Lana	80 %	20 %	0	0	0
CLAVICLE		percentage of DJD in the acromial end of the clavicle according to its degree				
		0	1	2	3	4
	Mesa del Mar	28,6 %	57,1 %	14,3 %	0	0
	Cueva de la Lana	22,2 %	44,4 %	33,4 %	0	0
	Cueva del Guanche	0	100 %	0	0	0
CLAVICLE		percentage of DJD in the sternal end of the clavicle according to its degree				
		0	1	2	3	4
	Mesa del Mar	40 %	40 %	20 %	0	0
	Cueva de la Lana	30 %	50 %	20 %	0	0
	Cueva del Guanche	25 %	50 %	12,5 %	12,5 %	0

Three cases of infraglenoid tubercle appear in seven of the scapulae suitable for study.

A case of acromial enthesopathy in three of the scapulae that preserved the acromion.

Of the eleven scapulae studied in Mesa del Mar, only three belonged to the left side.

### 3.4. Clavicle

Fifteen clavicles appear on the site, eight left and seven right, without signs of fracture.

Regarding to the degree of integrity:

- One less than 25%
- One between 25 and 75%
- Thirteen above 75%

In a similar way to the vertebral joints, five degrees of DJD were established for both, the acromial and the sternal end.

The percentages of DJD that present both clavicular ends are shown in Table 2.

Three of the fifteen clavicles of the burial of Mesa del Mar and eight of the thirty-three of all the burials studied have conoid tubercle.

Robusticity of the acromial end exist in seven of the fifteen clavicles of the cave of Mesa del Mar and eight of the eleven corresponding to the Cueva de La Lana.

Only eleven of the fifteen clavicles allow the study of the degree of robusticity of the sternal end, a marker that is only present in two of them.

Of the fifteen clavicles of the site, only thirteen allow the study of the presence of a rhomboid fossa. The results are shown in Table 3.

**Table 3.** Study of the presence-absence of the rhomboid fossa and its type in the funerary sites of Mesa del Mar, Cueva del Guanche and Cueva de la Lana.

	absent	channel	fossa	plateau
Mesa del Mar	4	0	7	2
Cueva del Guanche	3	0	2	1
Cueva de La Lana	7	2	0	1

## 4. CONCLUSIONS

Despite the state of fragmentation of bones, preliminary evidence seems to suggest that:

- The low number of thoracic vertebrae found in front of those that could be expected suggests that there is some type of taphonomic process in the burial that makes them more susceptible to fragmentation and subsequent destruction.
- Although the changes in the vertebral body are usually associated with age, the presence of crushing of the vertebral body is remarkable only in cervical vertebrae and not in the rest of the spine.
- There does not seem to be a high prevalence of DJD in the vertebral apophyseal joint surfaces in the site studied.
- Regarding the scapulae, the presence of DJD in the glenoid cavity, both at the site of Mesa del Mar and in those with which we have compared it (Cueva. De la Lana and Cueva. Del Guanche) indicate that the degree of DJD in the humeral-scapular joint is influenced more by a systemic factor (age) than by physical activity.
- A series of occupational stress markers appear in the clavicles that seem to be clearly associated with sex (Table 4).

All these data suggest that cervical and clavicular stress are compatible with a way of life in which Guanche women hold heavy weights on top of her head and performed labors that involved the handling of heavy weights.

**Table 4.** Percentage of the different types of clavicular markers present and their distribution by sex.

Marker	Total number of studied clavicles	Total number of clavicles that present marker	% about the total (*)	sex		
				♂	♀	Indet.
Conoid tubercle	33	8	24,2 %	2	5	1
Robusticity acromial end	26	15	57,7 %	6	8	1
Rhomboid fossa	29	15	51,7 %	4	7	4
Robusticity sternal end	29	6	20,7 %	0	6	0

(\*) For the estimation of these percentages, the three deposits were estimated: Mesa del Mar, Cueva del Guanche and Cueva de La Lana.

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