

SEXUAL DIMORPHISM OF SCAPULA BY VISUAL METHODS

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ABSTRACT

Introduction: Scapula presents various features and dimensions and it is one of the most interesting bones of the human body. The present study was done for sexual dimorphism of scapula by visual methods.

Materials and Methods: The study was carried out in the Department of Anatomy PCMS & RC Bhopal. 136 scapulae were observed out of which 96 were males and 40 were female scapulae. The following morphological features were taken into account for sexing the bone. Suprascapular notch, Superior border of Scapula and Acromial morphology. The results obtained were tabulated and compared with previous studies.

Observations and Results: The Type I (45.0%) & Type II (30.0%) Suprascapular notches were most commonly seen in females, while in Males Type III notch was more frequently observed (35.41%) than Type I & II. Type II superior border was more frequent in males (54 males 56.25%) and females (22 females 55.0%). Quadrangular type of acromion was more frequently found in both sexes followed by Falciform type in males and Triangular type in females.

Conclusion: Type III Suprascapular notch was more common in males while Type I was more frequent in females. Type II superior border was found with equal frequency in both males and females. Quadrangular type of acromion was more commonly seen to be associated with both the sexes. Thus present visual features have their limitations while determining the sex of the bone. Scapula "The Shoulder Blade" requires further more study in this regards.

KEY WORDS: Scapula, Suprascapular Notch, Superior Border, Sexual Dimorphism.

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INTRODUCTION

Anthropometry is an advanced branch in the research field where study of human skeleton is carried out to establish the individual identity like age, sex, stature etc. According to Hooton (1946) [1] "The determination of sex from the post cranial skeleton in adults is easy and certain in about 80% of cases, difficult but possible in another 10% cases and quite dubious

in the reminder".

Even than no single measurement of, or observation on, a bone is so clearly different in the two sexes as to warrant an unqualified assertion about the proper categorization of an individual specimen.

The pelvis was thought to be the best part of skeleton for sex determination followed by skull. However these complex and fragile bone

systems suffer from disadvantages of allowing a complete and radical evaluation only when they are in well preserved condition. Various methods, both metrical and visual, have been described for scapular dimorphism.

Present study aims at laying stress on various visual methods for sexing the scapula.

MATERIALS AND METHODS

The present study was carried out in the department of Anatomy PCMS & RC Bhopal. 136 scapulae were observed out of which 96 were males and 40 were female scapulae. The bones showing pathological deformity or fractures were excluded from the study.

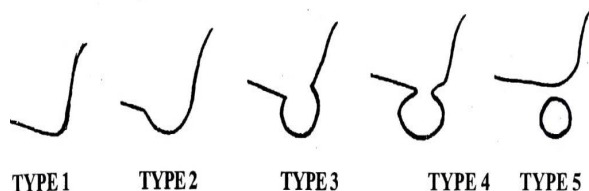
The following morphological features were taken into account for sexing the bone.

- A. Suprascapular notch
- B. Superior border of Scapula
- C. Acromial morphology

Suprascapular notch: It is located on the superior border at the base of the Coracoid process and serves for the passage of the Suprascapular nerve. This notch may be converted to a foramen by the Superior transverse ligament. This notch presents a range of grades, which for the purpose of description, are divide into five types by Vallois (1926) [2].

- Type I: Suprascapular notch absent
- Type II: Suprascapular notch shallow
- Type III: Suprascapular notch medium depth
- Type IV: Suprascapular notch deep
- Type V: Suprascapular notch converted to complete foramen

TYPES OF SUPRASCAPULAR NOTCH



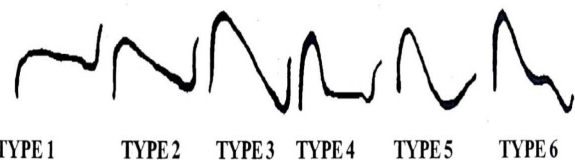
Superior border: It is the most variable part of the whole Scapula which extends from the Suprascapular notch to the superior angle of the bone. It is affected more or less by the development and action of three muscles namely;

Supraspinatous, Omohyoid and Serratus Anterior.

For purpose of description various forms of superior border, as proposed by Hrdlicka (1942) [3], are as follows

- Type I: Horizontal forming an angle of 90 degrees with line passing vertically upwards from the base of Coracoid.
- Type II: Oblique forming angle between 85 to 55 degrees.
- Type III: Steep with angle less than 55 degree.
- Type IV: Angular or deep saddle shaped.
- Type V: Semi lunar or markedly concave.
- Type VI: Concavo-convex.
- Type VII: Intermediate (which could not be classified)

TYPES OF SUPERIOR BORDER



Acromial morphology

The shape of acromion was classified as follows as per Gray, D.J (1942) [4]

1. Type 1- Quadrangular, which was recognised by existence of marked acromial angle and superior border distinct from the continued superior lip of crest of spine.
2. Type-2- Triangular lacks the superior border but possesses definite angle.
3. Type-3- Falciform, lacks both the angle and the distinct superior border but the infro-lateral acromial border curves more or less smoothly away from the spine.
4. Type- 4- Intermediate was the one, which showed mixed features.

Types of Acromion



Results were tabulated and subjected to statistical analysis.

OBSERVATIONS AND RESULTS

Table 1: showing the Percentage of various types of Suprascapular notch.

Suprascapular notch	Male (96)	Female (40)
Type I	28 (29.16%)	18 (45.0%)
Type II	22 (22.91%)	12 (30.0%)
Type III	34 (35.41%)	8 (20.0%)
Type IV	10 (10.41%)	2 (5.0%)
Type V	2 (2.08%)	0 (0.0%)

As per the table 1 it was observed that five types of Suprascapular notches were present in the series of 96 male and 40 female Scapulae. From the above observations it can be concluded that type I & II Suprascapular notches were most commonly seen in females. While in Males Type III notch was more frequently observed (35.41%) than Type I & II. In males a single pair of Scapula (2.08%) showed the ossification of superior transverse ligament, converting the notch to foramen.

Graph 1: Comparison of Suprascapular notch in males and females.

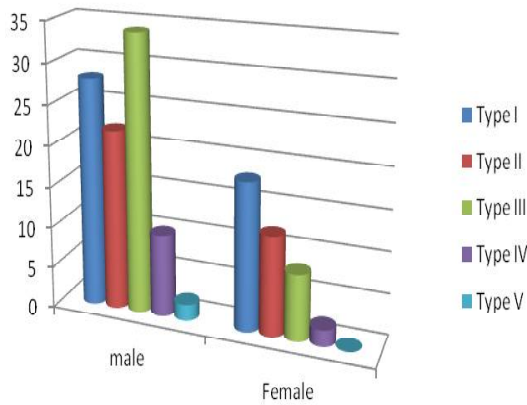


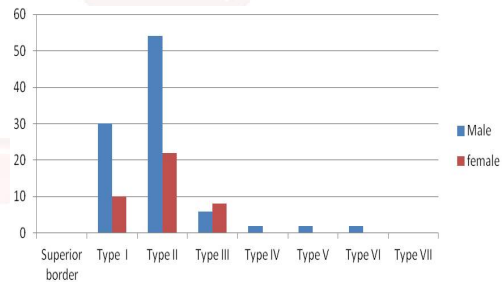
Table 2: Showing the Percentage of various types of Superior borders of Scapula.

Superior border	Male (96)	Female (40)
Type I	30 (31.25%)	10 (25.0%)
Type II	54 (56.25%)	22 (55.0%)
Type III	6 (6.25%)	8 (20.0%)
Type IV	2 (2.08%)	-
Type V	2 (2.08%)	-
Type VI	2 (2.08%)	-
Type VII	0 (0.0%)	-

According to Table 2- Type II superior border was more frequent in males (54 males 56.25%) followed by type I (30 males 31.25%) and Type III (6 males 6.25%). Type IV, Type V and Type VI were least observed in male Scapulae (2.08%) while Type VII was not to be found.

In females Type II was the commonest (22 females 55.0%) followed by Type I (10 females 25.0%) and Type III (8 females 20.0%).

None of the female scapulae showed Type IV to Type VII of the variants.



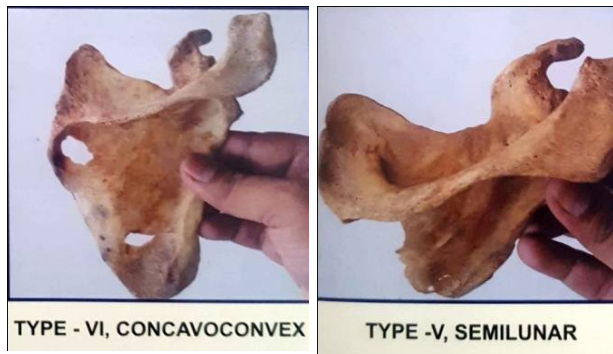
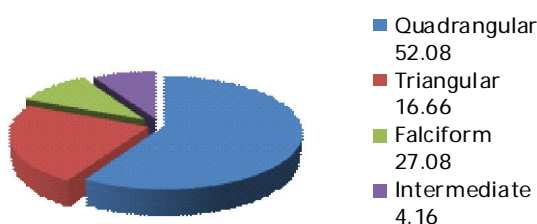


Table 3: Showing the percentage of various types of Acromion process of scapula.

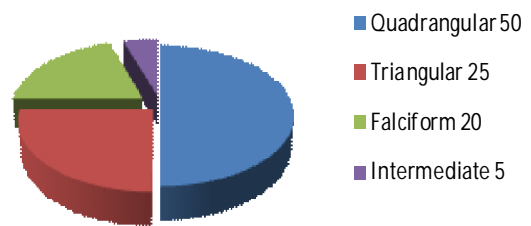
Acromion process (Type)	Out of 136	Male(96)	Female (40)
Quadrangular	70 (51.47%)	50(52.08%)	20(50%)
Triangular	26 (19.11%)	16(16.66%)	10(25.0%)
Falciform	34(25.0%)	26(27.08%)	8 (20.0%)
Intermediate	6(4.41%)	4 (4.16%)	2 (5.0%)



Percentages of types of Acromion in Males



Percentage of types of Acromion in Females



According to Table 3 Quadrangular type of acromion was more frequently found in both sexes followed by Falciform type in males and Triangular type in females.

DISCUSSION

The scapula is a necessity of and a product by the muscles that radiate from it towards the spine neck, chest and shoulder. It presents variant features and dimensions. It is common to all except the lowest vertebrates and has reached the highest differentiation in man.

Morphological study of Scapula was done with an aim to determine the occurrence of certain features, which were deviating from the normal textbook description of the bone.

The results were also compared with work done by different authors

Present study shows female preponderance of type I Suprascapular notch (45%) followed by type II (30%) and Type III (20%) respectively. Similar values were observed by Dongen RV⁵ (1963). Bainbridge (1963) [6] had found a higher percentage of Type IV Suprascapular notch (36.76%) while Hrdlicka [7] found predominantly Type III notch in females.

In present study Type III Suprascapular notch was more commonly found in males (35.41%) followed by Type I and Type II. Type IV and Type V were comparatively infrequent. Similar values were also reported by studies done by Bainbridge et al. (1963)⁶ and Hrdlicka⁷. While Dongen [5] had found Type I notches more commonly in males.

In present study Type V notch (Foramen) was very infrequent (2.08%). Its incidence was reported by Poirier and Charpy (1911) [8] as 5%, Kajava (1924) [9] as 1.5% , Vallois (1924) [10] as 6.5% and Gray D J(1942) [4] as 6.34%.

Table 4: showing comparison of different types of Suprascapular notch.

Suprascapular notch	Dongen 1963 [5]		Bainbridge, Tarazaga 1956 [6]		Hrdlicka [7]		Present study	
	M	F	M	F	M	F	M	F
Type I	56%	43%	15.21%	7.69%	2.80%	4.10%	29.16%	45.00%
Type II	32%	42%	10.86%	23.07%	16.70%	16.60%	22.91%	30.00%
Type III	12%	13%	45.62%	23.07%	57.10%	57.90%	35.41%	20.00%
Type IV	0.00%	2.00%	19.56%	30.76%	18.70%	16.80%	10.41%	5.00%
Type V	0.00%	0.00%	8.69%	15.38%	4.60%	2.50%	2.08%	0.00%

Table 5: showing comparison of different types of Superior border of Scapula.

Superior border	Dongen 1963 [5]		Hrdlicka 1942 [7]		Present study	
	M	F	M	F	M	F
Type I	20.00%	30.00%	9.80%	14.80%	31.25%	25.00%
Type II	78.00%	62.00%	27.50%	33.10%	56.25%	55.00%
Type III	2.00%	8.00%	7.40%	5.70%	6.25%	20.00%
Type IV	4.00%	-	11.80%	9.70%	2.08%	-
Type V	7.00%	-	42.30%	34.80%	2.08%	-
Type VI	3.00%	-	0.30%	-	2.08%	-
Type VII	4.00%	-	0.90%	1.90%	0.00%	-

Present study shows Type II superior border to be more frequent in females followed by Type I and Type III. Dongen [5] has reported predominance of Type II border followed by Type I in females. While Hrdlicka [7] has reported more frequent occurrence of Type V border in females. In Males Type II border was most frequently found in present study which was followed by Type I border. It was in accordance with the study done by Dongen. While Hrdlicka reported frequent presence of Type V border in males.

Table 3 shows percentage of different types of acromion processes in males and females. Quadrangular type was more frequent in both males and females (52.08% and 50.0% respectively). It was followed closely by Falciform type in males and triangular type in females (27.08% and 25.0% respectively).

CONCLUSION

The present study was carried out with the aim to distinguish male and female scapulae on the basis of various visual characteristics. Type III Suprascapular notch was more common in males while Type I was more frequent in females. Type II superior border was found with equal frequency in both males and females. Quadrangular type of acromion was more commonly seen to be associated with both the sexes.

Thus present visual features have their limitations while determining the sex of the bone. As pointed out by Krogman (1946) [11] "even when the entire human body, pelvis and skull are available, not more than 95% accuracy can be achieved" and according to Stewart (1954)¹² "measurements will never be a substitute for the speed and efficiency in which personal judgment, based on wide experience can effect a diagnosis on the sex of the skeleton".

Thus Scapula "the shoulder Blade" requires further more study in this regards.

Conflicts of Interests: None

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