

A study of morphometric variations of acromion process in human scapula and its clinical relation

S V Sathe^{1*}, R S Sathe²

{¹Associate Professor, Department of Anatomy} {²Associate Professor, Oral Medicine and Radiology}
Peoples Medical College, Bhanpur - 462037, Bhopal, Madhya Pradesh, INDIA.

Email: ansh251103@yahoo.co.in

Abstract

The human Scapula presents various features in terms of different anatomic features and dimensions. These variations have made it one of the most interesting bones in the body. **Materials and Methods:** The present study deals with the morphological and anatomical variations in the acromion process. The present study was carried out in the Department of Anatomy Peoples' College of Medical Sciences and Research Centre, Bhopal. 136 scapulae were observed out of which 96 were males and 40 were female scapulae. Acromion processes were classified into Type I (flat), Type II (curved) and Type III (hooked) as suggested by Bigliani *et al.* The shape of acromion was classified as per Gray D.J (1942) as Type 1- Quadrangular, Type-2- Triangular, Type-3- Falciform, Type- 4- Intermediate. **Observation and Results:** The present study shows that Quadrangular type of acromion was commonest 51.47%, followed by Triangular (19.11%), Falciform (25.0%) and Intermediate (4.41%). In the present study of 136 dry scapulae, type II (curved) acromions were observed in majority (42.17 %), whereas type I was present in (38.55%) and type III with (19.23 %) respectively. The results were tabulated and compared with previous studies. **Conclusion:** In the present study Quadrangular type of Acromion was found more commonly than Falciform and Traingular types. The type III (hooked) acromion, was associated with most of the rotator cuff tears.

Keywords: Scapula, Acromion, anatomical variation, rotator cuff tears.

*Address for Correspondence:

Dr. S. V. Sathe, Associate Professor, Department of Anatomy, Peoples Medical College, Bhanpur -462037, Bhopal, Madhya Pradesh, INDIA.

Email: ansh251103@yahoo.co.in

Received Date: 08/06/2016 Revised Date: 12/07/2016 Accepted Date: 02/08/2016

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	DOI: 06 August 2016

INTRODUCTION

The Human scapula has received considerable attention in the past partly by anatomist and partly by anthropologists. However it is obvious from the literature that the studies done on the scapula are comparatively less than other anthropometric studies on different bones. The Human Scapula is one of the most interesting bones of the skeletal unit; it is also called as the "Shoulder Blade". The association between acromial morphology and rotator cuff, shoulder impingement syndrome has been well documented by Bigliani (1986)^{1,2} and colleagues. Neer

(1972)³ documented the relationship between acromial morphology to the shoulder impingement syndrome. Morphologically acromion process of scapula is classified by Bigliani.^{1, 2} into three types; Type -I (flat), Type-II (curved), Type-III (hooked) A study conducted by Mako Hirano⁴ *et al.*, has suggested that the type III acromion was the most common in patients with rotator cuff tears. The type III (hooked) acromion, was present in most of the rotator cuff tears than type I or II acromion. Their study also suggested that acromial shape influences rotator cuff tears size. Edelson and Taitz⁵ concluded that the slope and length of the acromion and the height of the arch were most closely associated with degenerative changes. Increased degenerative changes of both types were associated with increased length of the acromion and length was in turn related to the shape of the acromion. The different shapes of acromion play important role in impingement syndrome. The variations of acromion process should be kept in mind during surgery around the shoulder joint. It helps Anthropologists during their study on evolution of acromion.^{6, 7} The aim of this study was to record the

morphometric values of the acromion process of scapula in Central India.

MATERIALS AND METHODS

The present study was carried out in the department of Anatomy People’s College of Medical Sciences and

Research Centre, 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. Acromion processes were classified into Type I (flat), II (curved) and III (hooked) as suggested by Bigliani *et al.*¹.

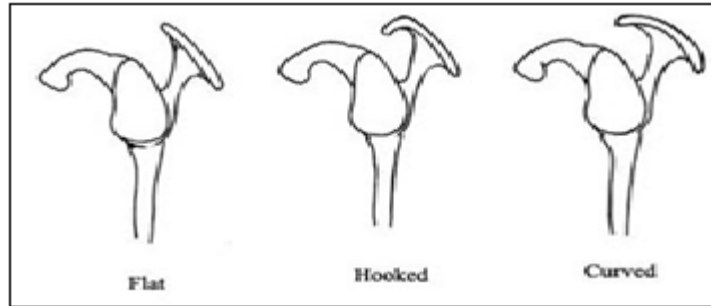


Figure 1

The shape of acromion was classified as follows as per Gray, D.J (1942)⁸

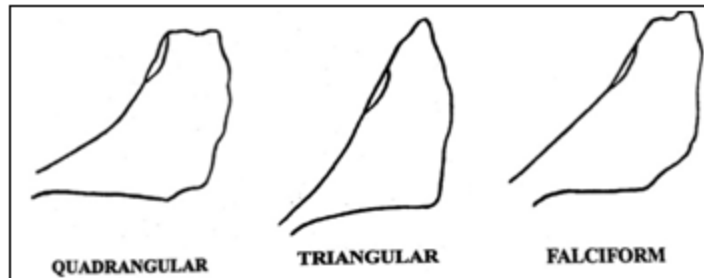


Figure 2

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.
 Type-2- Triangular lacks the superior border but possesses definite angle.
 Type-3- Falciform, lacks both the angle and the distinct superior border but the infero-lateral acromial border curves more or less smoothly away from the spine.
 Type- 4- Intermediate was the one, which showed mixed features.

OBSERVATION AND RESULTS

In the study of 136 dry scapulae, type II (curved) acromions were observed in majority (42.17%), whereas type I were present in 38.55% and type III with 19.23 % respectively. Acromion processes were classified into Type I (flat), II (curved) and III (hooked) as suggested by Bigliani.^{1,2}



Figure 3:

The shape of acromion process was classified according to Gray, D.J (1942).⁸



Figure 4:

Table 1: The following table shows 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%)

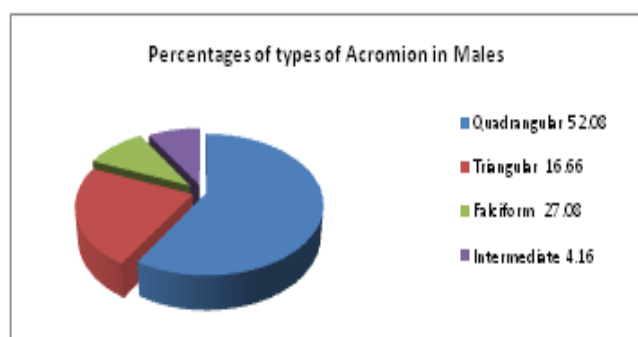


Figure 5

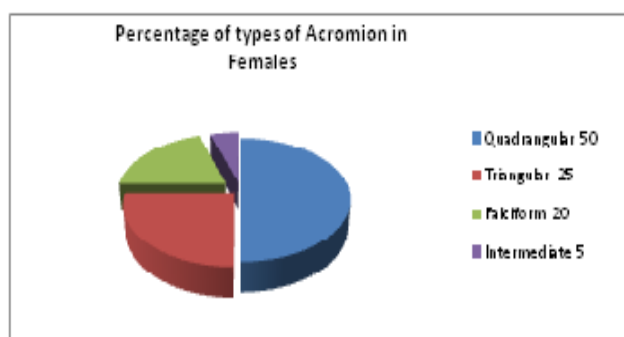


Figure 6

DISCUSSION

The acromion process plays a significant part in formation as well as in offering stability to the shoulder joint. The different acromial shapes have been attributed to both genetic and acquired causes, although age in the acquired cause is the most accepted cause for progression from flat to curved or hooked acromion. However these variations can also be observed due to distinct ethnic origin in demographic samples with inherent anatomical variations.⁹ The present study shows the increased incidence of Type II acromion (42.17%) followed by Type I (38.55) and Type III in 19.23%. This data is in accordance with other studies^{10, 11, 12, 13, 14, 15}. However, few other studies have shown a higher frequency of the type III or type I acromion.¹⁶ Gray D.J. (1942)⁸ had described the shape of acromial process into various types. These were triangular, Quadrangular, Falciform and intermediate. He found that 46.9% of the scapulae possessed Falciform acromial process, where as 28.1% were Traingular, and 19.8% were quadrangular while the percentage of intermediate or non characteristic was 5.1%. The triangular and Quadrangular acromial processes were commoner on the right side, which was ordinarily

associated with greater muscular development. In the present study the Quadrangular type of acromion was commonest 51.47%, followed by Triangular (19.11%), Falciform (25.0%) and Intermediate (4.41%).

Table 2: The following table shows the comparison of types of acromion process of Scapula

Acromion Types	Bainbridge <i>et al</i> ¹⁷	Gray ⁸	Vallois ¹	Kajava ¹	Present Study
Quadrangular	58.49%	19.8%	26.1%	55.8%	51.47%
Traingular	13.20%	28.1%	19.7%	8.3%	19.11%
Falciform	22.64%	46.9%	14.0%	5.7%	25.0%
Intermediate	5.66%	5.1%	40.1%	30.6%	4.41%

In the present study Quadrangular type of Acromion was found more commonly than Falciform and Traingular types. Similarly Quadrangular type was also most commonly found in the other studies done by Vallois, Bainbridge and Kajava. Whereas, increased percentage of Falciform type (46.90%) was observed by Gray D.J. (1942).⁸

CONCLUSION

Knowledge about various shapes of acromion are helpful for the orthopaedicians during surgical intervention of shoulder joint, data provided is also useful for Anatomist and anthropologists. The clinical implications of the present study are related with causative effect of the shape of the acromion in relation to the impingement syndrome as well as to rotator cuff rupture. The type III (hooked) acromion, was present in most of the rotator cuff tears. Fewer studies on this topic and different methodological approaches or techniques among studies have lead to variations in classifications and analysis. Thus the present study paves a way for future studies with a larger sample size to establish definitive relation regarding morphological variations of acromial process and its prevalence rate in the Indian population.

REFERENCES

1. Bigliani LU, Morrison DS, April EW. The morphology of acromion and its relationship to Rotator cuff tears. *Orthop. Trans* 1986; 10:228.
2. Bigliani L.U. et al (1991). The relationship of acromial architecture to rotator cuff disease. *clin sports.med*;10:823-828.
3. Neer CS (1972) anterior acromioplasty for the chronic impingement syndrome in the shoulder. *J.B.J.S. (Am)* 54:41-50.
4. Hirano M., Ide J. and Takagi K., Acromial shapes and extension of rotator cuff tears: magnetic resonance imaging evaluation. *Journal of Shoulder and Elbow Surgery*, 2002, vol. 11, n. 6, p. 576-8.
5. Edelson JG, Taitz C. Anatomy of the coraco: Acromial arch. Relation to degeneration of the acromion. *J Bone Joint Surg Br* 1992; 74:589-94.
6. Neer C.S. (1983) Impingement lesions *Clin orthop* 173: 70-77.
7. Singh J, Pahuja K et al. Morphometric parameters of the acromion process in adult human scapulae. *Indian Journal of Basic and Applied Medical Research*; September 2013: Issue-8, Vol.-2, P.1165-1170
8. Gray D. J. (1942). Variations in human scapula. *Amer. J. Phys. Anthropol.* 29, pp. 57-72.
9. Nelson AE, Braga L, Renner JB, Atashili J, Woodard J, Hochberg MC, et al. Characterization of individual radiographic features of hip osteoarthritis in African American and White women and men: the Johnston County Osteoarthritis Project. *Arth Care Res.* 2010; 62(2):190-97.
10. Paraskevas G, Tzaveas A, Papaziogas B, Kitsoulis P, Natsis K, Spanidou I S. Morphological parameters of the acromion, *Folia Morphol.* 2008; 67:255–60.
11. Worland RL, Lee D, Orozco CG, Sozarez F, Keenan J. Correlation of age, acromial morphology, and rotator cuff tear pathology diagnosed by ultrasound in asymptomatic patients. *J South Orthop Ass.* 2003; 12(1):23-26.
12. Coskun N, Karaali K, Cevikol C, Bahadir M, Demirel BM, Sindel M. Anatomical basics and variations of the scapula in Turkish adults. *Saudi Med J.* 2006;27(9):1320-25.
13. Toivonen DA, Tuite MJ, Orwin JF. Acromial structure and tears of the rotator cuff. *J Shoulder Elbow Surg.* 1995;4(5):376-83.
14. Collipal E, Silva H, Ortegall L, Espinoza E, Martinez C. The acromion and its different forms. *Inter J of Morphol.* 2010;28(4): 1189-92.
15. Natsis K, Tsikaras P, Totlis T, Gigis I, Skandalakis P, Appell HJ, Koebke J. Correlation between the four types of acromion and the existence of enthesophytes: a study on 423 dried scapulas and review of the literature. *Clin Anat.* 2007; 20(3):267- 72.
16. Schippinger G, Bailey D, McNally EG, Kiss J, Carr AJ. Anatomy of the normal acromion investigated using MRI. *Langenbecks Arch Chir.* 1997; 382:141–44.
17. Bainbridge D, Tarazaga S G (1956). A study of sex differences in Scapula. *J.Roy. Anthropol. Inst.*; 86. 101-134.
18. Vallois H V (1926). Variations de l'échanerure corcoïdienne de l'omoplate. *Ann. Anat. Path Etc*; 111-113.
19. Kajava Y (1924). Scapula scaphoidae (in Finnish) *Hels.* 12 mo, copp.

Source of Support: None Declared
Conflict of Interest: None Declared