



## Non-pathological bony features causing snapping scapula syndrome : a study with correlation to gender and side

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### ABSTRACT

A patient of snapping scapula usually presents with perceivable, appreciable and agonizing crepitus during the movements of scapula. This study aimed at focusing on bony features which are responsible for snapping scapula and study their incidence, morphology and correlation to gender and side of the scapula. The study was performed on 50 pairs of the human scapula of known sex in the Department of Anatomy at PGIMS Rohtak. The parameters recorded were medial scapular border morphology, presence of Tubercle of Luschka and the presence of Teres major tubercle or process. The most common type of medial scapular border was found to be Convex (73%) followed by Straight and Concave types. Luschka's tubercle was observed in only 6% of the scapula. Teres Major tubercle was present in 29% of the scapula, whereas Teres Major process was present in only 11% of the scapula and the process was curved in only 2% of the scapula. These findings are very important for orthopaedic point of view in the diagnosis and treatment of snapping scapula syndrome.

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### INTRODUCTION

The scapula is a large, flat and triangular bone lying on the posterolateral aspect of the chest wall, covering parts of the second to seventh ribs. It has costal and dorsal surfaces; superior, lateral and medial borders; inferior, superior and lateral angles and three processes, the spine, its continuation the acromion and the coracoid process (Standing, 2008).

A patient of snapping scapula usually presents with perceivable, appreciable and agonizing crepi-

tus during the movements of scapula. This syndrome was first reported in 1867 by Boinet (1867). When there is interference in-plane gliding movements of the subscapular fossa scapula over the convex thoracic wall, snapping scapula occurs. The various causes of snapping scapula includes bursitis, muscle abnormalities and bony or soft-tissue abnormalities (Ruland *et al.*, 1995; Safran, 1997).

Bony and soft-tissue lesions like malunited rib fractures, bony tumours or elastofibroma dorsi encroach on the scapulothoracic space and interfere with smooth movements of scapula causing crackling sound, resulting in soft-tissue problems and reactive bursitis. However, nonpathological anatomical variations comprise the most common aetiological factor in the bony structures. The non-pathological anatomical variations are (a) an extravagant anterior bending of the superomedial angle of scapula rubbing across the ribs, (b) the Luschka's tubercle at the superomedial angle of scapula which was originally thought to be an osteochondroma, but recently described as any bony prominence at the superomedial angle of the scapula and (c) a teres major process curved towards the anterior thoracic wall, which may be observed at the inferior

part of the lateral border of scapula (Kuhne *et al.*, 2009). In addition to that, in cases of the concave medial scapular border, the muscles inserting on the medial border of the scapula are deficient that may result in abnormal scapular motion leading to crepitus (Kuhns, 1945).

The present study is based on these non-pathologic bony anatomical variations which are involved in the pathogenesis of snapping scapula and evaluates their incidence, morphology and correlation to gender and side in dry scapula of North Indian population.

## MATERIALS AND METHODS

The present study was conducted on 50 pairs of dry human scapulae in the Deptt. of Anatomy, Pt. B.D. Sharma PGIMS, Rohtak (Haryana) in the year 2017-18. Out of 50 pairs, 30 belonged to males, and 20 were of females. Bones with clear and intact features were included in this study. Three anatomical parameters studied were as follows

### Tubercle of Luschka

Its presence or absence was noted down on a superior scapular angle (Figure 1).

### Teres major Tubercle or Process

A bony projection less than 2 cm at the origin of the teres major muscle was defined as a tubercle, while a bony projection greater than 2 cm was defined as a process. The teres major processes were further divided into those having a curvature towards the anterior thoracic wall and those without any curvature (Figures 2 and 3).

### Medial Scapular border

Morphologically the medial scapular border was classified into convex, straight and concave types (Figure 4).

## RESULTS AND DISCUSSION

Following observations were made

### Tubercle of Luschka

In the present study, Tubercle of Luschka was found in 6% of the scapula with an incidence of 5% in males, 7.5% in females, 4% on the right side and 8% on the left side (Table 1). Out of these 6 cases, Tubercle of Luschka with hooked superomedial angle was found in 4 cases (2 males & 2 females).

### Teres major Tubercle or Process

In the present study, no tubercle was observed in 58%, tubercle in 29%, the process not curved in 11% and process curved anteriorly towards thoracic

wall in 2% of the scapula. The same pattern was observed in males and females on both sides. The Teres major process curved anteriorly towards thoracic wall was found in 1.7% of male scapula, 2.5% of female scapula, 0% in right scapula and 4% in the left scapula (Tables 2 and 3).

### Medial Scapular border

In the present study, the convex medial scapular border was observed in a majority of scapula, i.e. 73% of scapula, followed by straight and concave types in 20% and 7% of scapula respectively. The same pattern was observed in males and females on both sides. The concave medial scapular border was found in 10% of male scapula, 2.5% of female scapula, 10% in the right scapula and 4% in the left scapula (Tables 4 and 5).

Snapping scapula usually occurs in age groups 20-30 yrs due to continual strain in the shoulder girdle and overhead arm use, but it is largely unnoticeable due to its rare incidence (Kuhne *et al.*, 2009). This syndrome is treated by conservative treatment initially like an application of ice, use of heat, ultrasound and specific muscular strengthening exercises (Lesprit *et al.*, 2001).

But this conservative treatment is beneficial only in cases of scapulohoracic bursitis secondary to repetitive stress and not in the cases of bony anatomic variations. Everlasting cure in such cases is achieved by surgical removal of the accountable bony pathology (Kuhne *et al.*, 2009).

Various studies have been conducted on the morphology and morphometry of the acromion and coracoid process of the scapulae (Singroha *et al.*, 2017; Verma *et al.*, 2017). But there is a shortage of literature on nonpathological bony variations involved in the pathogenesis of snapping scapula syndrome and that too in north Indian scapula of known sex.

### Tubercle of Luschka

Edelson, in a study on 700 dried scapulae, found the Luschka's tubercle in 6% of the cases. Our findings are in accordance with that reported by Edelson (Edelson, 1996).

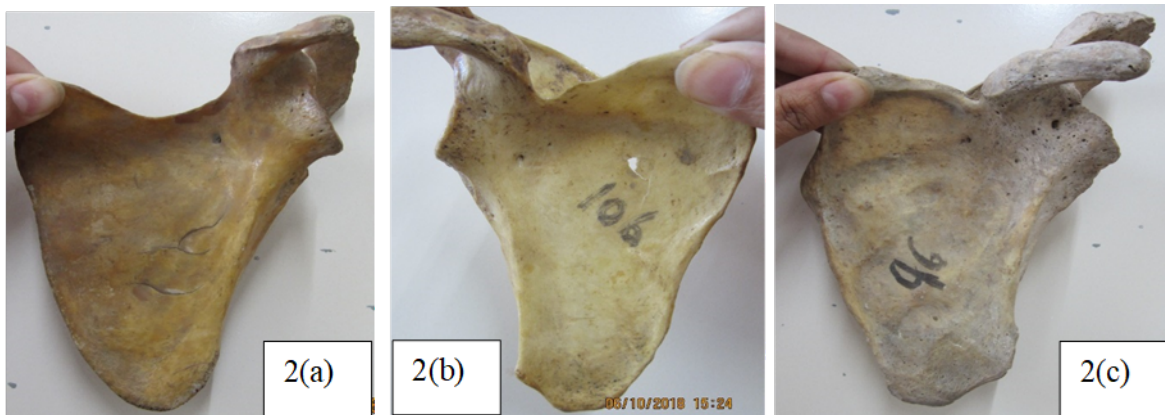
While Totlis *et al.* (2014) in a study on 264 scapulae, reported that the Luschka's tubercle was present in eight bones (3 %). Four of them were male scapulae and four female, while six of them were right and two left sides (Totlis *et al.*, 2014). On the other hand, we observed Luschka's tubercle more on the left side.

### Teres major Tubercle or Process

Totlis *et al.* (2014) in a study on 264 Greek scapu-



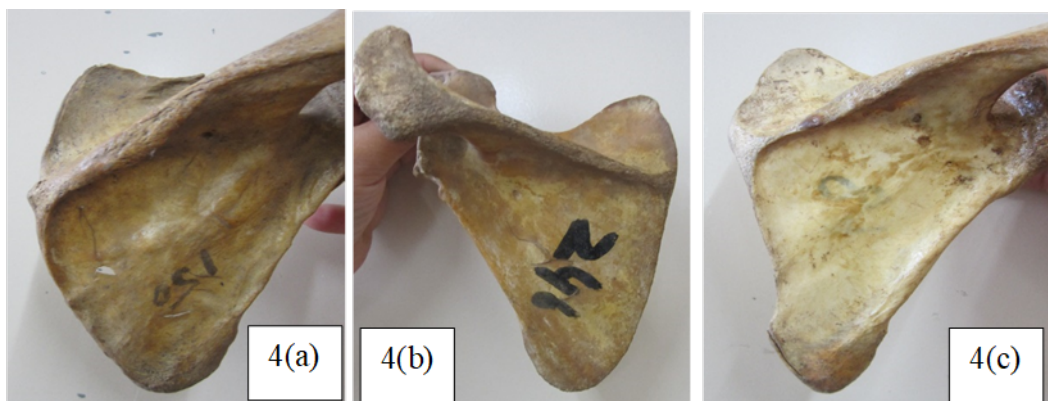
**Figure 1: Tubercle of Luschka on superomedial angle**



**Figure 2: (a) No Teres major tubercle (b) Teres major tubercle (c) Teres major process not curved towards thoracic wall**



**Figure 3: Teres major process curved anteriorly towards thoracic wall (a) Anterior view (b) Lateral view**



**Figure 4: Medial scapular border (a) Convex type (b) Straight type (c) Concave type**

**Table 1: Incidence of tubercle of luschka in males & females on right and left sides**

Gender	Tubercle of Luschka (%)	Side	Tubercle of Luschka
Male (n=60)	3 (5%)	Right	1
		Left	2
Female (n=40)	3 (7.5%)	Right	1
		Left	2
Total	6		6

**Table 2: Gender distribution of the teres major tubercle or process**

	Male (n=60)	Female (n=40)	Total
No Tubercle (%)	33 (55%)	25 (62.5%)	58
Tubercle (%)	16 (26.7%)	13 (32.5%)	29
Process not curved (%)	10 (16.7%)	1 (2.5%)	11
Process curved (%)	1 (1.7%)	1 (2.5%)	2

**Table 3: Side distribution of the teres major tubercle or process**

	Right (n=50)	Left (n=50)	Total
No Tubercle (%)	30 (60%)	28 (56%)	58
Tubercle (%)	14 (28%)	15 (30%)	29
Process not curved (%)	5 (10%)	6 (12%)	11
Process curved (%)	0 (0%)	2 (4%)	2

**Table 4: Gender distribution of the morphology of medial scapular border**

	Convex (%)	Straight (%)	Concave (%)
Male (n=60)	43 (71.7%)	11 (18.3%)	6 (10%)
Female (n=40)	30 (75%)	9 (22.5%)	1 (2.5%)
Total	73	20	7

**Table 5: Side distribution of the morphology of medial scapular border**

	Convex (%)	Straight (%)	Concave (%)
Right (n=50)	37 (74%)	7 (14%)	5 (10%)
Left (n=50)	36 (72%)	13 (26%)	2 (4%)
Total	73	20	7

lae, observed no tubercle in 50% cases, tubercle in 43.2% cases, process not curved in 3.4% cases and process curved towards thoracic wall in 3.4% cases (Totlis *et al.*, 2014).

Edelson (1996), in a study on 700 dried scapulae, found the Teres major process curved anteriorly towards thoracic wall in 1% of scapula (Edelson, 1996) while (Aggarwal *et al.*, 2011) found the same in 2.17% of the scapula (Aggarwal *et al.*, 2011), which is close to our findings, i.e. 2% of the scapula.

### Medial Scapular border

The concave medial scapular border is usually accompanied by a lack of the muscles inserted on the scapula resulting in snapping scapula syndrome (Kuhns, 1945). In the present study, the incidence of the concave type of the scapula medial border was 7%, which is close to those reported in the literature. Namely, (Totlis *et al.*, 2014) found the concave type in 11.4 % scapulae (Totlis *et al.*, 2014), Kuhns in 9% (Kuhns, 1945), Gray in 10 % (Gray, 1942) and Hrdlika in 10.7 % scapulae (Hrdlika, 1937).

### CONCLUSION

The most important non-pathologic bony structures of the scapula resulting in snapping scapula are not infrequent and comprises of the concave medial border of the scapula (7 %), the Luschka's tubercle (6 %) and teres major process curved towards the anterior thoracic wall (2 %). The Luschka's tubercle and the teres major process curved towards the anterior thoracic wall, usually require surgical resection as an everlasting cure and do not benefit from conservative treatment. This is of great importance for orthopaedic surgeons to bear in mind these non-pathologic bony structures during the diagnosis of snapping scapula.

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