

Incidence of Rhomboid Impression and Subclavian Groove in the Adult Human Clavicles

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ABSTRACT

Introduction: Clavicle is a morphologically distinct bone. It is the first bone to ossify and begins its ossification in membrane with two primary centers of ossification. Clavicles are absent from forelimbs in ungulates and carnivores but are well developed in prehensile limbs in primates and in man. Costoclavicular ligament is a strong, dense band which extends from the first costal cartilage and the adjoining part of the first rib to the inferior surface of medial part of the shaft of the clavicle an area named rhomboid impression. Side and Gender determination using clavicle is of value to Forensic specialists and Anthropologists; the relations of inferior surface of clavicle being important for Anesthesiologists, Orthopaedicians and Surgeon.

Methodology: This study was conducted in Department of Anatomy, NCR institute of Medical Sciences, Meerut. Total 140 dry clavicle bones were included in this study. This study was over a period of one year. The morphology of the clavicles was studied, with emphasis on their inferior surface.

Result: Subclavian groove was absent in 8 of the right and 16 of the left clavicles. In both right and left clavicles small sized subclavian groove was more common. Rhomboid impression showed variations in its size and depth.

Conclusion: Side differences in the features of the rhomboid fossa and subclavian groove were found in this study. Gender variations can be further analyzed to corroborate sex determination of unidentified bodies in forensic medicine. These morphological skeletal traits are also of great value for anthropologists and anatomists.

Keywords: Rhomboid Impression, Subclavian Groove, Costoclavicular Ligament.

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INTRODUCTION

The process of identification of humans, particularly in the determination of the sex of whole skeletons becomes very complex. It is stated by the American College of Radiology (1992)¹ that an inexperienced observer can confuse particular anatomic characteristics like the rhomboid fossa with pathologic conditions varying from a simple fibrous dysplasia to a chronic osteomyelitis. The costoclavicular ligament (ligamentum costoclaviculare) or rhomboid ligament, on its insertion in the lower portion of a clavicle, can produce impressions, tuberosities, depressions, and even a fossa. It is known anthropologically and anatomically as the rhomboid fossa.² Previously, the relationship between the presence of clavicular rhomboid fossa, and sex in skeletons of various populations has been evaluated worldwide. They found significant results related to incidence of the rhomboid fossa, being higher in males than females.^{3,4} In contrary, Jit & Kaur

(1986)^{5,6} did not find significant differences between sex in relation to incidence of the rhomboid fossa in Indian individuals. 59% of males and 54% of females showed this anatomic characteristic.⁶ A study conducted by Rogers et al (2000)² examined the presence of the rhomboid fossa in relation to sex and to age of individuals in determining the sex of unidentified skeletons, as the rhomboid fossa was usually related with males more than females for 113 female and 231 male clavicles.²

The subclavian vein is placed deep to coracoclavicular ligament. Clinically, rhomboid impression provides guidance for the placement of venous catheters, pacemakers, and also in the resection of clavicle during sternoclavicular joint instability.⁷⁻⁹ Rhomboid impression is also utilized in anthropology as a marker for age and sex determination.¹⁰ This normal variant of rhomboid impression may be described for pathological lesions

like necrosis, osteomyelitis, and tumors.¹¹ Besides, it is misdiagnosed in its unilateral presentation on X rays. No anthropometric studies have been conducted pertaining to the rhomboid impression in North Indian population. Therefore, the present study is aimed to find out both the morphological as well as anthropometric aspects of rhomboid impression in 200 adult human clavicles of North Indian population.

MATERIALS & METHODS

Study Area: This study was conducted in Department of Anatomy, NCR institute of Medical Sciences, Meerut.

Study Population: Total 140 dry clavicle bones were included in this study.

Study Duration: This study was over a period of one year.

Data Collection: Bones showing pathological deformity or fractures were excluded from the study. Parameters studied were rhomboid impression and subclavian groove. Rhomboid impression was studied as per AJE Cave classification. Rhomboid impression and subclavian groove were also assessed as absent, small, medium or large in terms of area as per L.J Ray recommendation.

Data Analysis: Data was analyzed using Microsoft excel.

Table 1: Types of rhomboid impression on right and left clavicles

Types	Rhomboid impression	Right (n=80)	Left (n=60)	Total (140)
1	Flat rough	30	26	56 (40%)
2	Flat smooth	14	18	32 (22.8%)
3	Deep rough	18	10	28 (20%)
4	Deep smooth	12	4	16 (11.4%)
5	Elevated rough	2	2	4 (2.8%)
6	Elevated smooth	4	-	4 (2.8%)

Table 2: Presence of subclavian groove

Sr. no.	Subclavian groove	Right (n=80)	Left (n=60)	Total (140)
1	Present	74	44	118(84.2%)
2	Absent	6	16	22(15.7%)

Table 3: Size of rhomboid impression and subclavian groove

Size	Right (n=80)	Left (n=60)	Total (140)
Absent	-	-	-
Small	20	32	52(37.1%)
Medium	36	6	42(30%)
Large	24	22	46(32.8%)

Table 4: Size of subclavian groove

Size	Right (n=80)	Left (n=60)	Total (140)
Absent	8	16	24(17.1%)
Small	34	24	29(20.7%)
Medium	26	10	36(25.7%)
Large	12	10	22(15.7%)

RESULTS

The incidence of rhomboid impression and subclavian groove were expressed in terms of percentage. It was found that the clavicles, both right and left mostly contained flat rough type of rhomboid impression (30 and 26) whereas flat smooth type was more common in left clavicle (18). Deep rough and deep smooth type was more frequent in right clavicles (18 and 12). Least frequent type of rhomboid impression was elevated rough and elevated smooth in both right and left clavicle. When incidence of subclavian groove was evaluated, we found that 74 of the right clavicles and 44 of left clavicles contained subclavian groove. Small sized rhomboid impression was mostly present in left clavicles (32). Whereas most of the right clavicles contained medium sized rhomboid impression (36). Subclavian groove was absent in 8 of the right and 16 of the left clavicles. In both right and left clavicles small sized subclavian groove was more common.

DISCUSSION

Structural details of bones are easily visualized due to the recent advancements in the field of imaging techniques. The morphology of attachment area of costoclavicular ligament, on the clavicle, is a relatively neglected entity. It can potentially cause diagnostic errors. Most of the researchers believe that the costoclavicular ligament is made up of anterior and posterior lamina with an intervening constant bursa¹², while others deny the bifascicular nature of the same.^{13,14} The connection between clavicle and first rib by costoclavicular ligament is regarded as fibrous joint by Hollinshed.¹⁵ While in those clavicles and first ribs, where such ligamentous attachment areas showed smoothness they indicate the presence of bursa between the two lamina of costoclavicular ligament. If circumscribed elevated and smooth type of impression is present then it is hypothesized that this is due to a bursal impression, the bursa forming the synovial cavity of the diarthrodial articulation between clavicle and first rib.¹⁶ The factors responsible for the above morphological variations are environment, genetic constitution, rate and pattern of growth and type of bone remodeling.^{17,18}

Results of this study showed that flat and rough type of rhomboid impression was present in both right and left clavicles. Similar findings were found by Balvir et al¹⁹ showing 30% incidence of flat and rough type of impressions in right clavicles and 33.33% in the left. In contrast, Rani et al²⁰, found that most predominant type of rhomboid impression is depressed and rough. Jit and Kaur^{5,6} did a study on large population of adult clavicles (789) in Indians for the presence of rhomboid fossa and reported that 37.3% incidence of deep and rough type of impression. The presence of rhomboid fossa is correlated with the age and sex of the individual by many workers.¹⁶⁻¹⁸ Paraskevas et al conducted a study on 80 chest radiographs. They found 26.88% incidence of excavated type of rhomboid fossa which was correlated with the gender, sidedness and handedness. They found higher incidence of fossa on right side in right-handed person and on left side in left-handed person. This study also found that 37.1% of the clavicles contained small sized and 33% of the clavicles contained large sized rhomboid impression. Similarly, 41.4% of the clavicles showed small sized subclavian groove and only 15.7% clavicles had larger subclavian groove. The subclavian groove was not present in 17.1% of cases. Balvir et al¹⁹ found that the incidence of large rhomboid

impression and large subclavian groove were 48.33% and 38.33% respectively on the other hand the incidence of small rhomboid impression and subclavian groove according to them were 17.5% and 20.83% respectively.

CONCLUSION

Clinically, the proper knowledge of various types of ligamentous impression and groove for subclavian vein on clavicle is important because these morphological varieties can be misinterpreted by radiologists while observing clavicular region. These morphological skeletal traits are very important for Forensic specialist, anthropologists, Orthopaedicians, Surgeons and Anatomists and more such studies are required in different populations.

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