

Case Report

BILATERAL OSSIFIED FIRST COSTOCHONDRAL AND CHONDROSTERNAL JOINTS: A CASE REPORT

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ABSTRACT :

The thoracic skeleton consists of twelve ribs on each side, connected to the sternum by means of costal cartilages. Costal cartilages are bar-shaped hyaline cartilages which articulate with corresponding ribs and articular facet on sternum forming costochondral & chondrosternal joints respectively. The 1st sternochondral joint between the manubrium and the first costal cartilage is an unusual form of synarthrosis and is often called as synchondrosis. Thick perichondrium of chondral cartilages are continuous with the periosteum of the ribs, which can get partially calcified in old age. Fusion of 1st costal cartilage may be due to normal mineralization which can occur at puberty. Some congenital abnormalities, traumatic injuries and other chronic inflammation around joints can lead to osteogenesis and fusion. Mineralization and osteogenesis in the 1st costal cartilage may be physiological age-related change.

During routine survey of our osteology lab of Department of Anatomy, a bilateral fusion of first rib with the sternum was found which resemble a bull horn. These types of anomalies may cause pain and swelling in the concerned area and difficulty in respiration. Awareness of this bony complex is important for physicians, orthopedic surgeons, radiologists and dermatologists.

Key Words : rib, costochondral joint, synchondrosis, synostosis

INTRODUCTION : The thoracic skeleton consists of twelve ribs on each side, connected to the central sternum by means of costal cartilages. Costal cartilages are bar-shaped hyaline cartilages covered by a thick perichondrium continuous with the periosteum of the ribs, which can get partially calcified in old age. Synovial cavities are present in all interchondral and most of the chondrosternal joints except for the first[1]. The 1st costal cartilage is continuous with the 1st rib and the manubrium, to form a primary cartilaginous joint that is an unusual form of synarthrosis, usually replaced by bone after 25 years[2-5].

CASE REPORT : During routine osteology teaching program for undergraduate medical students in the Department of Anatomy, King George's Medical University, UP, Lucknow, a bilateral fusion of first rib with the manubrium was found which resemble a bull horn. The complete bilateral ossified 1st costochondral and chondrosternal joint was found but body of sternum was missing which might be broken during bone processing. Some erosion was also present on anterior surface of sternum near manubrium on right side and on medial border of 1st rib which extended on posterior surface near its anterior end (Fig. 1 a & b).

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Fig. 1: Photograph showing sternum with bilateral fusion of first rib (Arrows) (a) Anterior view (b) Posterior view

DISCUSSION : There are few documentation of bilateral ossified first costochondral and chondrosternal joints in the literature. Sternocostal hyperostosis develops around the costal cartilage including periosteum, perichondrium and the ligament[6]. In old age, the costal cartilages tend to ossify superficially and loose their pliability and become brittle[4].

Costochondral anomalies at the upper end of thoracic cage may be due to defects in the segmentation of bony tissue during early development of the life and can be associated with variations in the disposition of neurovascular structures[7].

The present study is very much similar to that of Kumaraswamy and Kannadath who found a sternum which was fused bilaterally with the first rib resembling a bull horn and all the three parts of the sternum were also fused[8]. Ratnapriyanka et al[9] also reported similar finding as reported by us. Kampen et al described various findings on the basis of a radiological study done by normal and polarized light microscopy, on mineralization and osteogenesis of the 1st rib cartilage. He noted that onset of mineralization occurred at the end of puberty and was located directly beneath the perichondrium and bone was formed in a typical spur like manner medially from the upper edge of manubrium and laterally from the caudal rim of the bony part of 1st rib. He saw large cartilage canals with several blood

vessels and loose perivascular connective tissue in the central areas of the 1st costal cartilage and these parts were last to be mineralized and ossified in old age. Mineralization and osteogenesis in the 1st costal cartilage is a physiological age-related change and so cannot be regarded as degenerative process[10]. Anomalies like congenital rib defects either numerical or structural may be also associated. Numerical defects like supernumerary ribs and structural abnormalities including short rib, bifid rib or forked rib, fused or bridged ribs and pseudoarthrosis of first rib[11]. Etter (1944) reported that any of the first seven ribs may be bifid and there may be synostosis between any two ribs from 1st to 10th[12].

Fusion of ribs with the sternum can lead to restricted movements of chest during respiration and requires surgical intervention to relieve the symptoms. Direct or indirect pressure over adjacent neurovascular structures may produce different signs and symptoms in the patients. Costochondral and manubriosternal joints can be involved in SAPHO syndrome (Synovitis, Acne, Pustulosis, Hyperostosis, and Osteitis)[6]. It can be also associated with Teitze's syndrome in which sclerosis of the manubrium, calcification of the costal cartilage and soft tissue swelling can occur. It can also cause bilateral compression of subclavian vein resulting in venous congestion of upper limb. Symmetric high radionucleotide uptake in the sternoclavicular joints ca be seen in bone scans termed as "bull's head sign"[13].

CONCLUSION : Knowledge of fusion of first rib with manubrium is important for physicians, orthopedic surgeons, radiologists and dermatologists as the concerned area plays a vital role in the respiratory movements.

REFERENCES

1. Breathnach AS. Frazers' Anatomy of the Human Skeleton. 5th ed., J & A. Churchill Ltd, London (1958) p. 42–50.
2. Sinnatamby CS. Last's Anatomy: Regional and Applied, Thorax, 11th ed., Churchill Livingstone, Edinburgh (2006).
3. Datta AK. Essentials of Human Anatomy (Thorax, Abdomen and Pelvis) Part 1. 8th ed; Current Books International, Calcutta, India (2008).
4. Standring S. Gray's Anatomy. 40th ed., Elsevier Ltd, Spain (2008) p 917–922.
5. Singh IB. Textbook of Anatomy. Volume 2, Thorax, Abdomen and Pelvis. 5th ed; Jaypee Brothers Medical Publishers (P) Ltd, Delhi, India (2011).
6. Chigira M, Shimizu T. Computed tomographic appearances of sternoclavicular hyperostosis. Skeletal Radiol. (1989); 18: 347-352.
7. Todd TW. Costal anomalies of the thoracic inlet, their interpretation and significance. Anat anz. (1912); 41: 257-271.
8. Kumaraswamy SA and Kannadath BS. Bilateral fusion of first rib with sternum. Int J AnatVar. (2014); 7:55-56.
9. Ratnapriyanka J, Murudkar PKH, Boddeti RK, Ashwini, Ahmed N. Synostosis of first costomanubrial joint. Int J Anat Res. (2013); 1(3): 152-54.
10. Kampen WU, Classen H, Kirsch T. Mineralization and osteogenesis in the human 1st rib cartilage. Ann Anat. (1995); 177(2): 171-7.
11. Anita R, Archana R, Jyoti C, Punita M. Synostosis of first and second rib- Case Report. Journal of Anatomical Society of India. (2009); 58(2): 189-191.
12. Etter LE. Osseus abnormalities of the thoracic cage seen in forty thousand consecutive chest photo roentgenograms. Am J Roentgenol. (1944); 51: 359–363.
13. Dihlmann W, Dihlmann SW. Acquired hyperostosis syndrome; spectrum of manifestations at the sternoclavicular region. Radiologic evaluation of 34 cases. Clin Rheumatol. (1991); 10: 250-263.