

A Case report: Unilateral synostosis of first sternocostal joint.

Dr. Jyoti Bhardwaj^{1*}, Dr. Paras Shrimankar², Dr. Sucheta Chaudhary³

¹Second year resident, ²Associate Professor, ³Professor & Head, Department of Anatomy, B. J. Medical College, Ahmedabad, Gujarat.

Abstract:

Synostosis is an immobile joint formed when the gap between two bones ossifies and become a single bone. Bony joints can be formed by ossification of fibrous or cartilaginous joints. The first sternocostal joint is an unusual variety of synarthrosis, inaccurately called as synchondrosis. The attachment of the first rib to the sternum also becomes a synostosis with age. This rare synostosis of sternocostal joint was found incidentally during routine osteology classes at Department of Anatomy, BJMC, Ahmedabad, Gujarat, India. This specimen showed rare unilateral synostosis of first rib with sternum on left side. This synostosis can lead to restricted chest wall movements and compression of neurovascular bundle causing thoracic outlet syndrome (TOS). Knowledge of such rare synostosis is of utmost importance to anatomists, thoracic surgeons, orthopedicians, radiologists, dermatologists.

Keywords: Sternocostal joint, Synarthrosis, Synchondrosis, Synostosis.

Introduction:

Sternum a flat bone consists of manubrium (prosternum), body (mesosternum) and xiphoid process (metasternum). Synostosis is an immobile joint formed when the gap between two bones ossifies and they become a single bone. The first sternocostal joint is a primary cartilaginous joint which is replaced by bone usually after 25 years. Bony joints can be formed by ossification of either fibrous or cartilaginous joints. Synchondrosis or primary cartilaginous joint are the joints where the bony surfaces are joined by cartilage and later are completely replaced by bone (synostosis)¹. The junction between the xiphoid process and gladiolus usually gets transformed into a synostosis by 40th year. Total length of sternum is 17 cm in males, less in female on an average². The manubrium to gladiolus length ratio varies among the sexes³. Growth may continue beyond the third decade and possibly throughout life². The incidence of synostosis of ribs is 0.3% of the population. It is usually asymptomatic but they may cause musculoskeletal pain or intercostal nerve entrapment. Involvement of the first rib is one of the causes of thoracic outlet syndrome⁴.

Case report:

A rare case of unilateral synostosis (left side) of first sternocostal joint was found during routine osteology

* Corresponding Author:

Dr. Jyoti Bhardwaj

Email: jyotib323@gmail.com

QR Code:



demonstration in the department of Anatomy, B.J. Medical College, Ahmedabad. The specimen was examined in detail and photographed and relevant measurements were recorded using digital vernier caliper. The maximum width at the site of fusion of first rib with sternum on left side was 2.58 cm. The total length of sternum was 17.92 cm which is more than the average total length of sternum in males.

Image 1: Showing unilateral (left side) synostosis of first sternocostal joint with arrow.



Discussion:

Costo-chondral 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 it may be associated with variations in the disposition of neuro-vascular structures⁵. Costal anomalies occur frequently at thoracic outlet causing thoracic outlet syndrome (TOS). Literature review showing that there were many reported cases over the first rib anomalies which include the floating rib, central defects bridged by ligamentous bands, rudimentary structure terminating in a synostosis or pseudoarthrosis with second rib, bifurcated first rib, sterno-costo-clavicular hyperostosis etc⁶.

Synostosis between manubrium and gladiolus occur in 10% of individuals replacing the cartilaginous union. It is more common in females than in males⁷. In old age, the costal cartilages tend to ossify superficially and lose their pliability and become brittle². Sternocostal hyperostosis develops around the costal cartilage including periosteum, perichondrium and the ligament⁸. Usually hyperostosis is followed by synostosis. It presents along with clavicular hyperostosis and is considered a part of SAPHO syndrome (Synovitis, Acne, Pustulosis, Hyperostosis, and Osteitis). In the earliest stage, hyperostosis occurs around the cartilaginous portion of first rib. Fusion anomalies of ribs are associated with 22 syndromes like congenital scoliosis, Klippel-feil syndrome, Jarco-levin syndrome, Poland syndrome, Basal cell naevus (Gorlin syndrome), VATER syndrome, Down's syndrome and many more⁹. The possibility that the primary or matrilineal type of synostosis may figure in the aetiology of lung disease, particularly phthisis, which should be more fully investigated by both clinicians and pathologists¹⁰.

It can also lead to bilateral compression of subclavian vein causing upper limb venous congestion^{11,12,13}. Symmetric high radio nucleotide uptake in the sternoclavicular joints can be seen in bone scans and is termed as "bull's head sign"¹¹. Rib fusion with the manubrium

may causes scoliosis and restriction of chest wall expansion which may require surgical interventions to relieve the symptoms¹².

Kumaraswamy and Kannadath found sternum which was bilaterally fused with first rib⁷. Ratnapriyanka et al also reported the same findings¹³. But the present study showed unilateral (left side) synostosis of sternum with first rib.

Conclusion:

A precise knowledge of skeletal deformity of thoracic cage is important for the anatomists, physicians, thoracic surgeons, radiologists and dermatologists as it is concerned with respiratory movements. Surgeons have to keep in mind such fusion anomalies for the cases of thoracic outlet syndrome (TOS) and scoliosis. It may also be associated with clavicular hyperostosis and is considered as a part of SAPHO syndrome.

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