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CASE REPORT

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Unilateral Synostosis of First Sternocostal Joint

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ABSTRACT

A bony joint or synostosis, is an immobile joint formed when the gap between two bones ossifies and they become a single bone. Bony joints can form by ossification of either fibrous or cartilaginous joints. The first sternocostal (manubriocostal) joint is an unusual variety of synarthrosis. This raresynostosis of manubriocostal joint was found incidentally during routine osteology classes of undergraduate MBBS students in the Department of Anatomy, King George's Medical University, U.P., Lucknow, India. The specimen showed rarest unilateral synostosis of first rib with the sternum on left side. It can lead to compression of neurovascular bundle causing thoracic outlet syndrome. Very few literatures have been reported for this anomaly. The knowledge of this anomaly is important especially for surgeons and radiologists for interpretation.
Keywords: Synostosis, Sternoocostal Joint, Rib and Synarthrosis.

INTRODUCTION

The ribs are 12 pairs of elastic arches which articulateposteriorly with the vertebral column and form the greater part of the thoracic skeleton. The first seven pairs are connected to the sternum by costal cartilages, and are referred to as the true ribs. Costal cartilages are bar-shaped hyaline cartilages covered by thick perichondrium which is continuous with the periosteum of the ribs. These cartilages articulate with small concavities on the lateral sternal borders called as chondrosternal articulations (Standring 2008). The first sternocostal joint is an unusual variety of synarthrosis, and is often inaccurately called assynchondrosis. Synchondrosis or primary cartilaginous joints are joints where the bony surfaces are united by cartilage and later completely replaced by bone i.e. synostosis (Jain

1984).Synostosis is an immobile joint formed when the gap between two bones ossifies and they become a single bone. The two synchondrosis however may persist throughout life, these are the 1st sternocostal and peribasilar joint (Romanes 1981).The attachment of the first rib to the sternum also becomes a synostosis with advancing age (Saladin 2011).

CASE REPORT

A rare case of unilateral synostosis of first sternocostal (manubriocostal) joint was found incidentally during routine osteology classes for undergraduate MBBS students in the Department of Anatomy, King George's Medical University, Uttar Pradesh, Lucknow, India. All the three parts of sternum were not present. Only the manubrium (presternum) was present at the time of reporting. Mesosternum or gladiolus and xiphoid process or metasternum were missing. The measurements were taken byvernier calipers.

The maximum thickness at suprasternal notch was 1.7cm. The maximum thickness at the manubriosternal joint was 1.5cm.The maximum thickness at the site of fusion of first rib with sternum on left side was about 1.4cm. The maximum breadth of manubrium was 4.2cm and the length of manubrium from jugular notch to manubriosternal joint was 3.9cm (Fig. 1 & 2).

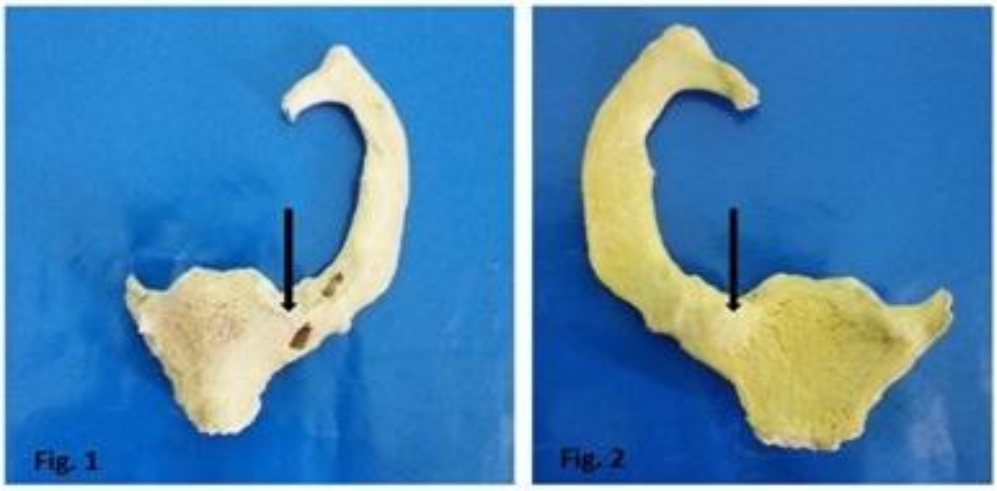

Figure 1. Photograph showing unilateral (left) synostosis of first sternocostal joint from anterior aspect (arrow).

Figure 2. Photograph showing unilateral (left) synostosis of first sternocostal joint from posterior aspect (arrow).

DISCUSSION

Review of literature shows that there are very few studies on unilateral and bilateral cases of synostosis of first rib with sternum. Costo-chondral anomalies at the upper end of thoracic cage can be the probable cause of defects in the segmentation of bony tissue during early development of the life and can be associated with variations in the disposition of neuro-vascular structures (Todd 1912).In the present study, the fused first rib was of normal caliber and fused with the sternum at the usual site.

First rib malformations such as rudimentary rib and fused ribs may result in post fixed brachial plexus with a large contribution from second thoracic nerve (Stopford & Telford 1919, Gupta et al. 2009). The contribution of second thoracic nerve may causeextra pressure on the groove (Gupta et al. 2009). Rib fusion with the manubrium may lead to scoliosis and restriction of chest wall expansion which may require surgical interventions to relieve the symptoms (Dale & Lewis 1975, Glass et al. 2002).

The present case report is very much similar to that of Ashwini et al. (2015) and Verma et al. (2015) but in their study, synostosis of the first sternocostal joint was bilateral. Synostosis between manubrium and gladiolus occur in10% of individuals replacing the cartilaginous union. It is usually more common in females than in males. Bilaterally used first rib with sternum resembles a bull horn (Kumaraswamy & Kannadath 2014). It can also cause bilateral compression of subclavian vein which leads to upper limb venous congestion. A symmetric high radio nucleotide uptake in the sternoclavicular joints is usually seen in bone scans and is termed as "bull's head sign."(Dihlmann & Dihlmann 1991).

It is considered asa part of SAPHO syndrome (Synovitis, Acne, Pustulosis, Hyperostosis, and Osteitis) and presents with clavicular hyperostosis (Ashwini et al. 2015).There are very few clinical studies suggesting that neurological symptoms and vasomotor changes of thoracic outlet syndrome (TOS) could be attributed to broad attachment of scalenusmedius muscle(White et al. 1945,Gupta et al. 2009, Keen 1907). Compression of neurovascular structures can occur while passing from neck to axilla through a narrow interval between scalenus anterior, hypertrophied scalenusmedius and first rib (Gupta et al. 2009, White et al. 1945). Etter (1944) reported that any of the first seven ribs may be bifid and there may be synostosis between any two ribs from $1^{st}$to 10^{th} (Etter 1944). 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 (Verma et al. 2015).

CONCLUSION

Awareness of this bony complex is important for physicians, orthopaedic surgeons, thoracic surgeons, radiologists, dermatologists as well as for anatomists. It may be associated with clavicular hyperostosis and is considered as a part of SAPHO syndrome (Synovitis, Acne, Pustulosis, Hyperostosis and Osteitis). Rib anomalies are also associated with syndromes like congenital scoliosis, polydactyly syndrome and many more.

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