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RESEARCH ARTICLE

SYNOSTOSIS OF FIRST MANUBRIOCOSTAL(STERNOCOSTAL) JOINT-A RARE CASE REPORT

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ABSTRACT

Synostosis is an immobile joint formed when the gap between two bones ossifies and become a single bone. Bony joints can form by ossification of either 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 manubriocostal (sternocostal) joint was found incidentally during routine osteology classes for undergraduate MBBS students at Department of Anatomy, Sri Devaraj Urs Medical college,Kolar, Karnataka, India. We observed that the specimen showed the rarest bilateral synostosis of first rib with the sternum .The synostosis was examined and relevant measurements were taken in detail using vernier calipers.Synostosis leads to compression of neurovascular bundle causing thoracic outlet syndrome. It may be associated with clavicular hyperostosis and is considered a part of SAPHO syndrome (Synovitis, Acne, Pustulosis, Hyperostosis and Osteitis).We have hardly few literatures reporting this rare bilateral manubriocostal synostosis and knowledge of such rare synostosis is thereby of utmost importance to thoracic surgeons, orthopedicians, radiologists, dermatotologists dealing with this region.

INTRODUCTION

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.

Synchondrosis or primary cartilaginous joint are joints where the bony surfaces are joined by cartilage and later are completely replaced by bone(synostosis)(K.K.Jain ,1984 ; A.K.Dutta, 2010; Saladin, 2011).

In infancy right and left frontal and mandibular bones fuse to form single bones. In old age cranial sutures become obliterated by ossification.

The epiphyses and diaphysis of the long bones are joined by cartilaginous joints in childhood and adolescence, and these become synostosis in early adulthood (Saladin, 2011).

Two synchondrosis however may persist throughout life,these are the 1st sternocostal and peribasilar joints(G.J Romanes, 1981).The First sternocostal joint is an unusual variety of synarthrosis and often inaccurately called as synchondrosis(Standring ,2008).The attachment of the first rib to the sternum also becomes a synostosis with age (Saladin, 2011).

The incidence of synostosis of ribs is 0.3% of the population. Congenital anomalies of the ribs are usually discovered as an incidental finding on routine radiography.

It is usually asymptomatic but they may cause musculoskeletal pain or intercostal nerve entrapment. Involvement of the 1st rib is one of the causes of thoracic outlet syndrome (Anupama *et al*,2013).

The congenital rib defects are classified into numerical defects such as supernumerary ribs like cervical, sacral or pelvic ribs found in association with VATER and Down's syndrome and the structural defects such as short rib, bifid or forked rib, bridged rib, fused rib and pseudoarthrosis of first rib.

Fusion anomalies are associated with 22 syndromes like congenital scoliosis, Klippel Feil, Jarco Levin, Poland, Gorlin ,basal cell naevus, polydactyly syndrome and many more (J.Ratnapriyanka, 2013; V.Lokanayaki ,2013;

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Anupama K *et al* , 2013; Jain MK, 2009 ;Glass RB, 2002;Tsirikos 2005).

Development rib anomalies are diagnosed in patients by using frontal radiographs and are best evaluated using CT/MRI(Glass RB, 2002).

MATERIALS AND METHOLOGY

This rare synostosis of manubriocostal (sternocostal) joint was found incidentally during routine osteology classes for undergraduate MBBS students at Department of Anatomy, Sri Devaraj Urs medical college,Kolar, Karnataka, India. We observed that the specimen showed bilateral synostosis of first rib with the sternum. The synostosis was examined and relevant measurements were taken in detail using vernier calipers.

Case Report

We report a case of rare bilateral synostosis of manubriocostal (sternocostal) joint which was found incidentally during routine osteology classes for undergraduate MBBS students at Department of Anatomy, Sri Devaraj Urs medical college,Kolar, Karnataka, India.Only the manubrium or presternum was present at the time of reporting of the case. Mesosternum or gladiolus and xiphoid process or metasternum were missing. The measurements were taken in detail using vernier calipers.

The maximum thickness at suprasternal notch was 1.5cm.The maximum thickness at manubriosternal joint was 1.6cm.The maximum thickness at site of fusion of first rib with sternum on right side measured about 1.8cm.

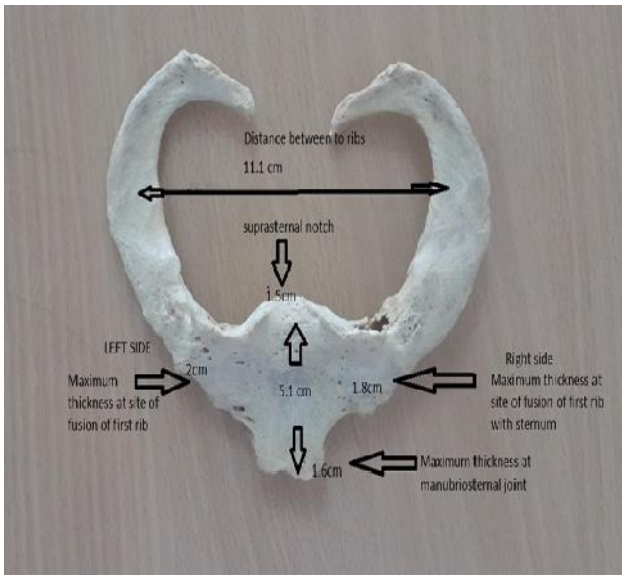

Figure 1 showing bilateral synostosis of first manubriocostal(sternocostal) joint with measurements taken using vernier calipers

The maximum thickness at site of fusion of first rib with sternum on left side measured about 2cm.The maximum breadth of manubrium between the ribs was 8.1cm.The maximum length of manubrium from jugular notch to manubriosternal joint was 5.1cm.The maximum distance between the 2 first ribs was 11.1cm.(Figure 1)

Picture of Bilateral synostosis of first manubriocostal (sternocostal) joint

DISCUSSION

Synostosis between manubrium and gladiolus occur in 10% of individuals replacing the cartilaginous union. It is more common in females than in males.(Suba Anantikumaraswamy 2014).

Suba AnantiKumaraswamy (2014) reported a case of sternum which was fused bilaterally with the first rib resembling a bull horn .

All the three parts of the sternum were fused as well. In old age, the costal cartilages tend to ossify superficially and loose their pliability and become brittle. 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).

Maugers *et al* proposed that lesions begin with infection of the joint and lead to osteolysis, erosion, hyperostosis and finally synostosis followed by ankylosis and reduction of hyperostosis.

Patients may present with spontaneous fracture, chronic recurrent painful swelling of the sternoclavicular region, aseptic inflammation, and hyperostosis of the clavicle, sternum,upper ribs and its adjacent soft tissues.

It can also lead to bilateral compression of subclavian vein causing upper limb venous congestion. Symmetric high radionucleotide uptake in the sternoclavicular joints can be seen in bone scans and is termed as “bull’s head sign”.

J.Ratnapriyanka (2013) also reported a very rare specimen of synostosis of 1st costomanubrial joint and reported various causes and age related changes.

Synostosis leads to compression of neurovascular bundle causing thoracic outlet syndrome Many

literatures have reports of bifid ribs and fused ribs(V.Lokanayaki ,2013; Anupama K *et al*,2013)

Naveen kumar *et. al* (2013) reports a rib variation involving left 3rd rib and 3rd costal cartilage.

Liat Gindes (2008) describes the clinical importance of abnormal ribs and its association with spondylothoracic dysostosis.

H Zeirhut *et al* (2011) did a hospital based case control study where rib abnormalities were assessed predominately by X-ray and reported association of rib anomalies with childhood cancers.

Jain *et al* (2009) reported a case of VATER association with multiple rib anomalies.

Duru *et al* (2009) reported segmental costovertebral malformations associated with neural tube defects.

Ronald A.Bergman *et al* (1954) mentions about the fusion of two lateral halves of sternum in manubrial region.

G.T.Ashley (2008) did a study on the morphological and pathological significance of synostosis at manubriosternal joint in 683 sternum and reported that primary or matrical type of synostosis is more common than sclerotic type.

Very few literatures have reports of synostosis of first manubriocostal or sternocostal joint and we report this rare case as an attempt to bring about awareness in clinicians about the synostosis of first manubriocostal or sternocostal joint as it is associated with compression of neurovascular bundle causing thoracic outlet syndrome and SAPHO syndrome.

CONCLUSION

Synostosis of first manubriocostal or sternocostal joint leads to compression of neurovascular bundle causing thoracic outlet syndrome.

It may be associated with clavicular hyperostosis and is considered a part of SAPHO syndrome (Synovitis, Acne, Pustulosis, Hyperostosis and Osteitis).

Rib anomalies are also associated with syndromes like congenital scoliosis, Klippel Feil, Jarco Levin, Poland, Gorlin, basal cell naevus, polydactyly syndrome, VATER anomaly and many more.

We have hardly few literatures reporting this rare bilateral first manubriocostal synostosis and knowledge of such rare synostosis is thereby of utmost importance and creates opportunity for future clinicians, thoracic surgeons, orthopedicians, radiologists and dermatotologists to face challenges and threats dealing with this region.

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