eISSN 1308-4038

International Journal of Anatomical Variations (2014) 7: 55–56

Case Report

# Bilateral fusion of first rib with sternum

Published online June 12th, 2014 © http://www.ijav.org

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Received June 18th, 2013; accepted February 7th, 2014

## Abstract

Inlet of thorax is bounded by the manubrium in front, costal cartilage, first rib on both side and the first thoracic vertebra behind. A specimen of sternum fused with manubrium and xiphisternum and bilateral fusion of first rib to the manubrium was observed. The total length of the sternum was 17.14 cm. A sternal foramen of 6.77 x 3.47 mm was observed in the xiphoid process. The sternum was convex with maximum anterior convexity of 16.2 mm. It usually presents along with clavicular hyperostosis and is considered a part of SAPHO syndrome (Synovitis, Acne, Pustulosis, Hyperostosis and Osteitis). This fused bony complex can cause restriction of chest wall movement and decreased pulmonary function. Thus dermatologists faced with patients presenting with pustulous and acne form skin lesions must be aware of both SAPHO syndrome and its effect on the sternocostal joints.



**Key words** [sternum] [first rib] [synostosis] [xiphisternum]

## 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 sternum consists of manubrium or presternum, gladiolus or mesosternum, xiphoid process or metasternum. The manubrium is the thickest portion which articulates with the gladiolus by a layer of fibrocartilage that does not ossify until late in life. Synostosis between manubrium and gladiolus occur in 10% of individuals replacing the cartilaginous union. It is more common in females than in males [2].

Sternum as a whole shows a slight forward convexity. The xiphoid process, partly bone and partly cartilaginous is set deeper than the rest of the body of the sternum. The junction between the xiphoid process and gladiolus usually gets transformed into a synostosis by 40th year. Total length of sternum in 17 cm in males and less in female on an average [3]. The manubrium:gladiolus length ratio varies among the sexes. Etter reported that any of the first seven ribs may be bifid and there may be synostosis between any two ribs from 1st to 10th [4].

## Case Report

Out of the bones housed in the Department of Anatomy, one sternum was found to be fused bilaterally with the first rib resembling a bull horn (Figure 1). All the three parts of the sternum were fused as well. Measurement was done by means of a digital vernier caliper. The total length of the sternum was 17.14 cm. A sternal foramen of 6.77x3.47 mm was observed in the xiphisternum. The sternum was convex with maximum anterior convexity of 16.2 mm.

## Discussion

The manubriocostal joint between 1st costal cartilage and manubrium is an unusual form of synarthosis. In old age, the costal cartilages tend to ossify superficially and loose their pliability and become brittle [3]. 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 ribs. Sternocostal hyperostosis develops around the costal cartilage including periosteum, perichondrium and the ligament [5].

SAPHO can affect all age groups, with higher incidence found among females. Symptoms may be of anterior chest wall pain with restriction of chest wall movement and decreased

**Figure 1.** Anterior view of the sternum with bilateral fusion of first rib resembling bullhorn. ***Arrow*** showing *sternal foramen* in xiphisternum.

pulmonary function due to polyostotic involvement. Sternoclavicular joint is the most common site of involvement followed by spine and sacroiliac joints. Costochondral and manubriosternal joints are involved in less frequency. Joint space narrowing may also be present.

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 [6]. 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 [7]. 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" [8]. NSAIDS are the first line of treatment [9]. Awareness of this bony complex of fused first rib with manubrium is important for the orthopedic surgoens, radiologists and dermatologists, because of its association with SAPHO.

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