

Chapter 1 : Sternum - Anatomy Pictures and Information

The sternum or breastbone is a long flat bone located in the center of the chest. It connects to the ribs via cartilage and forms the front of the rib cage, thus helping to protect the heart, lungs, and major blood vessels from injury.

The primary responsibilities of the ribcage involve protecting the thoracic visceral organs, enclosing the thoracic visceral organs, and is included in the general mechanics of the process of breathing. It provides structural support for the upper extremities as well as the pectoral girdle. There are specified bones within the ribcage that are responsible for the production of red blood cells from the active bone marrow. Consisting of the upper manubrium, the central body, and the lower xiphoid process, the sternum creates an anchor for the ribs meeting centrally at the midline of the body. The xiphoid process is typically made up of cartilage. Costal notches create anchors for the costal cartilage to attach, which are formed along the lateral sides of the sternum. At the superior end of the manubrium there resides a jugular notch. On either side of the sternal notch the clavicular notch can be found. The costal cartilage of the first and second ribs meets with the manubrium. The second through the tenth ribs meet with the body of the sternum via costal cartilage. The xiphoid process is available for muscle attachment and does not adhere to the ribs. Where the two opposing costal margins meet at the xiphoid process is the costal angle. Between the body of the sternum and the manubrium even with the second rib the sternal angle, also known as the angle of Louis, can be found. The 3 primary angles, the costal angle, the sternal angle, and the costal margins are landmarks when determining positional suitability concerning the thorax and the abdomen.

Sternum THE RIBS The twelve pairs of ribs, which are embedded within the walls of the muscular structures, attach in the posterior to a thoracic vertebra. The first 7 pairs are also called true ribs. Ribs 8 through 12 are deemed false ribs. The remaining 2 pairs of ribs are considered floating ribs as there is no attachment to the sternum at all. True ribs connect directly to the sternum while false ribs are connected to the sternum via additional bone structures, and floating ribs do not connect to the sternum.

Ribs Ribs do vary structurally, although the top ten pairs of ribs all come equipped with a head and a tubercle for attachment to the vertebrates. The final two pairs are equipped with a head but are lacking a tubercle. All twelve pairs have a neck, angle, and a body. The head of each rib is designed to project posteriorly and joins with the body of the corresponding thoracic vertebra. The tubercle is knobby in appearance and resides just laterally of the head. It joins with the facet on the transverse process of the thoracic vertebra. The constricted area that is designed between the head and the tubercle is known as the neck. The main portion of the rib is curved to allow for structural support of the body. The costal groove runs along the inner surface of the body and appears as a depressed canal. The costal groove is designed to provide protection for the costal nerve and its corresponding vessels. The intercostal muscles take up the space between the ribs, which have been deemed the intercostal spaces.

Chapter 2 : Sternum | Chest bone : Human Anatomy

The sternum, or breastbone, is a flat bone at the front center of the chest. The ribs and sternum make up what is called the 'ribcage.' The ribcage protects the lungs, blood vessels, and heart.

The sternum develops as three distinct parts: The shape of the sternum looks somewhat like a sword pointing downwards, with the manubrium forming the handle, the body forming the blade, and the xiphoid process forming the tip. It forms joints with the clavicles and the first and second pairs of ribs through their costal cartilages. The clavicles meet the manubrium at the concave clavicular notches to form the sternoclavicular joint, the only point of skeletal attachment between the pectoral girdle of the shoulder and the axial skeleton of the thorax. Slight indentations on the lateral sides of the manubrium provide attachment points for the costal cartilages of the ribs. At its inferior end, the manubrium meets the body of the sternum at the joint with the costal cartilage of the second ribs. Here it forms the sternal angle, a slight posterior bend in the sternum that can be felt through the skin and serves as an important anatomical landmark in the medical profession. Several important muscles attach via tendons to the manubrium, including the sternocleidomastoid, pectoralis major, sternohyoid, and sternothyroid muscles. The body of the sternum is the longest region of the sternum and is roughly rectangular in shape. The costal cartilages of the second through tenth ribs connect to the body of the sternum to form the bulk of the rib cage. Just like in the manubrium, slight concave indentations in the lateral sides of the body of the sternum provide stronger attachment points for the costal cartilages to prevent rib separation. In addition, the powerful pectoralis major muscles that adduct and flex the humerus at the shoulder attach to the anterior surface of the body of the sternum and manubrium. The smallest and most inferior region of the sternum, the xiphoid process, begins life as a region of flexible hyaline cartilage attached to the end of the body of the sternum. The xiphoid process slowly ossifies throughout childhood and adulthood until around age 40 when all of its cartilage is replaced by bone. Regardless of its degree of ossification, the xiphoid process serves as an important attachment point for the tendons of the diaphragm, rectus abdominis, and transverse abdominis muscles. Several undesired events can take place at the sternum. During open heart surgery, the sternum must be cut in half along its long axis to provide access to the heart. After surgery, the two halves of the sternum must be wired back together with stainless steel wire to prevent their separation. Any extreme stresses placed on the broken sternum after surgery, such as lifting heavy objects, can result in the wires cutting through the bony tissue and severely damaging the sternum. Another risk associated with the sternum is the fracturing of the xiphoid process during CPR, which can potentially lead to the xiphoid process breaking off and lodging into one of the delicate vital organs below it.

Chapter 3 : Xiphoid process - Wikipedia

The sternum, commonly known as the breastbone, is a long, narrow flat bone that serves as the keystone of the rib cage and stabilizes the thoracic skeleton. Several muscles that move the arms, head, and neck have their origins on the sternum.

Breast Bone The sternum Figs. Its upper end supports the clavicles, and its margins articulate with the cartilages of the first seven pairs of ribs. In its natural position the inclination of the bone is oblique from above, downward and forward. It is slightly convex in front and concave behind; broad above, becoming narrowed at the point where the manubrium joins the body, after which it again widens a little to below the middle of the body, and then narrows to its lower extremity. Its average length in the adult is about 17 cm. Sometimes the ridges limiting the attachments of these muscles are very distinct. Its posterior surface, concave and smooth, affords attachment on either side to the Sternohyoideus and Sternothyroideus. The inferior border, oval and rough, is covered in a fresh state with a thin layer of cartilage, for articulation with the body. The lateral borders are each marked above by a depression for the first costal cartilage, and below by a small facet, which, with a similar facet on the upper angle of the body, forms a notch for the reception of the costal cartilage of the second rib. Between the depression for the first costal cartilage and the demi-facet for the second is a narrow, curved edge, which slopes from above downward and medialward. **Body corpus sterni; gladiolus.** At the junction of the third and fourth pieces of the body is occasionally seen an orifice, the sternal foramen, of varying size and form. The posterior surface, slightly concave, is also marked by three transverse lines, less distinct, however, than those in front; from its lower part, on either side, the *Transversus thoracis* takes origin. The inferior border is narrow, and articulates with the xiphoid process. Each lateral border Fig. These articular depressions are separated by a series of curved interarticular intervals, which diminish in length from above downward, and correspond to the intercostal spaces. Most of the cartilages belonging to the true ribs, as will be seen from the foregoing description, articulate with the sternum at the lines of junction of its primitive component segments. This is well seen in many of the lower animals, where the parts of the bone remain ununited longer than in man. **Xiphoid Process** *processus xiphoideus; ensiform or xiphoid appendix.* Above, it articulates with the lower end of the body, and on the front of each superior angle presents a facet for part of the cartilage of the seventh rib; below, by its pointed extremity, it gives attachment to the *linea alba*. The xiphoid process varies much in form; it may be broad and thin, pointed, bifid, perforated, curved, or deflected considerably to one or other side. These two bars fuse with each other along the middle line to form the cartilaginous sternum which is ossified from six centers: The ossific centers appear in the intervals between the articular depressions for the costal cartilages, in the following order: The centers make their appearance at the upper parts of the segments, and proceed gradually downward. Occasionally some of the segments are formed from more than one center, the number and position of which vary Fig. Thus, the first piece may have two, three, or even six centers. When two are present, they are generally situated one above the other, the upper being the larger; the second piece has seldom more than one; the third, fourth, and fifth pieces are often formed from two centers placed laterally, the irregular union of which explains the rare occurrence of the sternal foramen Fig. More rarely still the upper end of the sternum may be divided by a fissure. Union of the various centers of the body begins about puberty, and proceeds from below upward Fig. The xiphoid process may become joined to the body before the age of thirty, but this occurs more frequently after forty; on the other hand, it sometimes remains ununited in old age. In advanced life the manubrium is occasionally joined to the body by bone. When this takes place, however, the bony tissue is generally only superficial, the central portion of the intervening cartilage remaining unossified.

Chapter 4 : What is the Breast Bone? (with pictures)

Sternum Definition and Function. The sternum or breastbone is a vertical flat bone lying at the anterior middle part of the chest.. Externally, it is made up of compact bone. Inside of it is a cancellous or spongy tissue that is entirely vascula.

It consists of three parts; Manubrium sterni: The uppermost part Body shaft: The middle part Xiphoid process: The lowest part Ossification of sternum: Ossification occurs by a total of 6 centers. One is for manubrium, four for body and one for xiphoid process. It is the angle formed between the manubrium and body of sternum. The vertex of this angle lies at the manubriosternal joint. Sternum Chest bone The sternum chest bone lies in the midline of the anterior chest wall. It is a flat bone that can be divided into three different parts: Manubrium sterni, Body of sternum and Xiphoid process. It is the upper-most part of the sternum that articulates with: The right and left clavicles First costal cartilages of both sides Upper part of the second costal cartilage of both sides It is quadrangular in form and lies at the level of third and fourth thoracic vertebrae of the spinal cord. The superior border of manubrium is thick, actually the thickest part of the bone and forms the jugular notch. On the surface of human body, the jugular notch can be easily seen as depression just above the manubrium. The anterior surface of this part of the bone is convex from side to side while the posterior surface is concave. It is longer, narrower and thinner as compared to the manubrium sterni, with which it articulates superiorly at the manubriosternal joint, which is of fibrocartilaginous type. At the lower border, it articulates with the xiphoid process at the xiphisternal joint. The body of sternum is of flat contours and contains notches on each side for articulation with the costal cartilages. There are a total of 12 costal cartilages but only first 7 articulate with the sternum directly. It is the smallest and lowest part of the bone and is actually a thin plate of hyaline cartilage. It may become ossified at its proximal end in the adult life but it is purely cartilaginous in children and teenagers. It is not attached to ribs or costal cartilages. Ossification of sternum The sternum originally consists of two cartilaginous bars, situated one on either side of the median plane and connected with the cartilages of the upper ribs. These two bars fuse with each other along the middle line to form the cartilaginous sternum which is ossified from six centers: One for manubrium sterni: Appears at the sixth month and rarely unites with other centers except at the old age. Four for the body: The first of these four appears at sixth month, second and third at 7th month and fourth appears one year after birth. They unite with each other after puberty. One for the xiphoid process: It appears at 5th to 18th year of life but remains partly cartilaginous. Sternal Angle Sternal Angle: It is also known as Angle of Louis and is formed by the articulation of the body of sternum with the manubrium sterni. It is present in the form of ridge at the site of the manubriosternal joint and lies opposite the intervertebral disc between third and fourth thoracic vertebrae. The sterna angle lies adjacent to the second intercostals space fairly consistently and for this reason, it is used as a guide to count the ribs and intercostals spaces.

Chapter 5 : Sternum | Revolv

The sternum (Figs. to) is an elongated, flattened bone, forming the middle portion of the anterior wall of the thorax. Its upper end supports the clavicles, and its margins articulate with the cartilages of the first seven pairs of ribs.

Figure 6 Peculiarities Figure 7 The sternum develops from two cartilaginous bars one on the left and one on the right, connected with the cartilages of the ribs on each side. These two bars fuse together along the middle to form the cartilaginous sternum which is ossified from six centers: The ossification centers appear in the intervals between the articular depressions for the costal cartilages , in the following order: The centers make their appearance at the upper parts of the segments, and proceed gradually downward. To these may be added the occasional existence of two small episternal centers, which make their appearance one on either side of the jugular notch ; they are probably vestiges of the episternal bone of the monotremata and lizards. Occasionally some of the segments are formed from more than one center, the number and position of which vary [Fig. Thus, the first piece may have two, three, or even six centers. When two are present, they are generally situated one above the other, the upper being the larger; the second piece has seldom more than one; the third, fourth, and fifth pieces are often formed from two centers placed laterally, the irregular union of which explains the rare occurrence of the sternal foramen [Fig. More rarely still the upper end of the sternum may be divided by a fissure. Union of the various centers of the body begins about puberty , and proceeds from below upward [Fig. The xiphoid process may become joined to the body before the age of thirty, but this occurs more frequently after forty; on the other hand, it sometimes remains ununited in old age. In advanced life the manubrium is occasionally joined to the body by bone. When this takes place, however, the bony tissue is generally only superficial, the central portion of the intervening cartilage remaining unossified. Clinical significance Bone marrow biopsy Because the sternum contains bone marrow , it is sometimes used as a site for bone marrow biopsy. In particular, patients with a high BMI obese or grossly overweight may present with excess tissue that makes access to traditional marrow biopsy sites such as the pelvis difficult. Sternal opening A somewhat rare congenital disorder of the sternum sometimes referred to as an anatomical variation is a sternal foramen, a single round hole in the sternum that is present from birth and usually is off-centered to the right or left, commonly forming in the 2nd, 3rd, and 4th segments of the breastbone body. Congenital sternal foramina can often be mistaken for bullet holes. A fracture of the sternum is usually a comminuted fracture. The most common site of sternal fractures is at the sternal angle. Some studies reveal that repeated punches or continual beatings, sometimes called "breastbone punches", to the sternum area have also caused fractured sternums. Those are known to have occurred in contact sports such as rugby and football. Sternal fractures are frequently associated with underlying injuries such as pulmonary contusions , or bruised lung tissue. It may also result from minor trauma where there is a precondition of arthritis. Resection The sternum can be totally removed resected as part of a radical surgery, usually to surgically treat a malignancy, either with or without a mediastinal lymphadenectomy Current Procedural Terminology codes and , respectively. Bifid sternum or sternal cleft A bifid sternum is an extremely rare congenital abnormality caused by the fusion failure of the sternum. It is endochondral in origin. In amphibians and reptiles it is typically a shield-shaped structure, often composed entirely of cartilage. It is absent in both turtles and snakes. In birds it is a relatively large bone and typically bears an enormous projecting keel to which the flight muscles are attached. Arthropods In arachnids , the sternum is the ventral lower portion of the cephalothorax. It consists of a single sclerite situated between the coxa , opposite the carapace. Sternum cut along the frontal plane showing interior of the bone. Position of the sternum the thoracic cage.

The breast bone, also known as the sternum, is a long, flat bone located in the middle of the chest region of the human calendrierdelascience.com bone is connected to the ribs by a flexible type of connective tissue called cartilage.

Sternum Sternum Definition and Function The sternum or breastbone is a vertical flat bone lying at the anterior middle part of the chest. Externally, it is made up of compact bone. Inside of it is a cancellous or spongy tissue that is entirely vascular. The adult length of the sternum measures cm. It is larger in males than in females. Sternum protects the organs inside the mediastinum, especially the heart [1, 2, 3].

Parts of the Sternum

Manubrium The manubrium sterni is the most superior part of the sternum that lies at the levels of 3rd and 4th thoracic vertebrae. The superior border of the manubrium has the broadest structure among the other parts of the sternum. On its center is the suprasternal or presternal or jugular notch. This is the depressed part that can be palpated in between the clavicles. The lateral sides of the superior border of the sternum articulate with the clavicles via sternoclavicular joints. The lateral borders have facets that articulate with the ribs. The inferior border has a cartilage that articulates with the sternal body at manubriosternal joint. The anterior surface serves as an attachment to the pectoralis major and sternocleidomastoid muscles. The posterior surface serves as an attachment to the sternohyoid and sternothyroid muscles.

Body The corpus sterni or gladiolus is the longest part of the sternum, although it is narrower than the manubrium. The body of the sternum is found at the level of T5-T9 vertebrae. The anterior surface of the sternal body is almost flat. It is where the pectoralis major is attached. There are three horizontal ridges that pass through the 3rd, 4th, and 5th articular facets. Between the 3rd and 4th parts of the sternal body, the sternal foramen can be seen. The posterior surface also has these three lines. On its lower end is the origin of the transversus thoracis. The superior border of the sternum articulates with the manubrium through the manubriosternal joint. The gap between the two is called the sternal angle or angulus Ludovici or angle of Louis, named after Antoine Louis. The lateral border has articular depressions on which the 2nd to 7th costal cartilages are attached. The inferior border is the narrowest part of the manubrium and it articulates with the xiphoid process through the xiphisternal joint which lies at the level of the 9th thoracic vertebra. At birth until young adulthood, there are four sternabrae attached to sternal synchondroses. When a person reaches 25 years, these sternabrae fuse to form three synostoses.

Xiphoid Process The xiphoid process, also known as processus xiphoideus, ensiform or xiphoid appendix, is the smallest part of the sternum. It lies at the level of T10 vertebra. Costal cartilages nor ribs are attached to it. It is made up of cartilage until it ossifies at the age of 40 and in some cases, they become one with the sternal body in old age. The superior border articulates with the sternal body via xiphisternal joint. On its sides are articular facets that provide attachment to the 7th rib. The inferior border gives rise to the linea alba. The anterior surface is where the anterior costoxiphoid ligament and a part of rectus abdominis are attached. The posterior costoxiphoid ligament, transversus thoracis, and diaphragm are attached to the posterior surface. The lateral borders are connected with abdominal aponeuroses [1, 2, 4].

Where is the Sternum Located? Sternum is a part of the skeletal system. It lies on the anterior thoracic wall in the middle. Its parts are the manubrium green , body blue , and xiphoid process violet.

Anterior View of the Sternum Image Source: Clinical Anatomy 2nd edition Picture 7: The first sternocostal joint is categorized as synchondrosis. The succeeding joints are symphysis.

Joints of the Sternum Image Source: This is a very important landmark since it is where the costal cartilages and ribs are first counted. It rests at the level of 2nd costal cartilage and in between 4th and 5th thoracic vertebrae.

Xiphoid Process as a Landmark Xiphoid process may be small but it is an important landmark for the structures beneath it. It serves as a landmark for: To obtain a bone marrow biopsy, a large bore needle is introduced into the sternum and a sample is aspirated [4].

Surgery A bone saw is used to gain access to the thoracic cavity in surgeries involving the heart, great vessels, thymus gland, and retrosternal goiter. Wire sutures are used to close the sternum in surgery.

Sternal Fracture The costal cartilages cushion the sternum and protect it from injury or trauma. However, too much force cannot be handled by the sternum and that is where fracture and dislocation set in. The manubrium may be displaced from the sternal body. Fracture of the sternum may also be associated with fracture of the

thoracic vertebrae [3, 5]. Sternum Pain Picture Thoracic Cage Injuries Sternal fracture is a form of a simple thoracic cage injury. Although simple, it should still be given immediate medical attention. Sternum is located in the middle of the chest cavity. The surrounding anatomical structures are attached to it. So if these become damaged, no matter how simple the diagnosis may be, there will be a resulting sternal pain. Respiration is an involuntary, essential function. It involves spontaneous, continuous movement of the thoracic cage, including the sternum. If the sternum is broken, common sense will tell that pain results. There will be pain in your sternum with each breath you take. Causes of Pain under right rib cage Treatment for Sternum pain To deal with sternum pain, nerve block is performed wherein the intercostal nerve that transmits pain signals to the brain is being anesthetized [6].

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See Article History Human skeletal system, the internal skeleton that serves as a framework for the body. This framework consists of many individual bones and cartilages. There also are bands of fibrous connective tissue—the ligaments and the tendons—in intimate relationship with the parts of the skeleton. This article is concerned primarily with the gross structure and the function of the skeleton of the normal human adult. The human skeleton, like that of other vertebrates, consists of two principal subdivisions, each with origins distinct from the others and each presenting certain individual features. These are 1 the axial, comprising the vertebral column—the spine—and much of the skull, and 2 the appendicular, to which the pelvic hip and pectoral shoulder girdles and the bones and cartilages of the limbs belong. Discussed in this article as part of the axial skeleton is a third subdivision, the visceral, comprising the lower jaw, some elements of the upper jaw, and the branchial arches, including the hyoid bone. When one considers the relation of these subdivisions of the skeleton to the soft parts of the human body—such as the nervous system, the digestive system, the respiratory system, the cardiovascular system, and the voluntary muscles of the muscle system—it is clear that the functions of the skeleton are of three different types: Of these functions, support is the most primitive and the oldest; likewise, the axial part of the skeleton was the first to evolve. The vertebral column, corresponding to the notochord in lower organisms, is the main support of the trunk. The central nervous system lies largely within the axial skeleton, the brain being well protected by the cranium and the spinal cord by the vertebral column, by means of the bony neural arches the arches of bone that encircle the spinal cord and the intervening ligaments. A distinctive characteristic of humans as compared with other mammals is erect posture. The human body is to some extent like a walking tower that moves on pillars, represented by the legs. Tremendous advantages have been gained from this erect posture, the chief among which has been the freeing of the arms for a great variety of uses. Nevertheless, erect posture has created a number of mechanical problems—in particular, weight bearing. These problems have had to be met by adaptations of the skeletal system. Protection of the heart, lungs, and other organs and structures in the chest creates a problem somewhat different from that of the central nervous system. These organs, the function of which involves motion, expansion, and contraction, must have a flexible and elastic protective covering. Such a covering is provided by the bony thoracic basket, or rib cage, which forms the skeleton of the wall of the chest, or thorax. The connection of the ribs to the breastbone—the sternum—is in all cases a secondary one, brought about by the relatively pliable rib costal cartilages. The small joints between the ribs and the vertebrae permit a gliding motion of the ribs on the vertebrae during breathing and other activities. The motion is limited by the ligamentous attachments between ribs and vertebrae. The third general function of the skeleton is that of motion. The great majority of the skeletal muscles are firmly anchored to the skeleton, usually to at least two bones and in some cases to many bones. Thus, the motions of the body and its parts, all the way from the lunge of the football player to the delicate manipulations of a handicraft artist or of the use of complicated instruments by a scientist, are made possible by separate and individual engineering arrangements between muscle and bone. In this article the parts of the skeleton are described in terms of their sharing in these functions. The disorders and injuries that can affect the human skeleton are described in the article bone disease.

Chapter 8 : Sternum - Anatomy, Fracture, Pain and Location

In the human embryo, the sternum first appears as two bands of cartilage which fuse in the center of the chest. This fused band gives rise to six bones, called sternabrae, that gradually combine to become the adult breastbone.

Figure 6 Peculiarities Figure 7 The sternum develops from two cartilaginous bars one on the left and one on the right, connected with the cartilages of the ribs on each side. These two bars fuse together along the middle to form the cartilaginous sternum which is ossified from six centers: The ossification centers appear in the intervals between the articular depressions for the costal cartilages, in the following order: The centers make their appearance at the upper parts of the segments, and proceed gradually downward. To these may be added the occasional existence of two small episternal centers, which make their appearance one on either side of the jugular notch; they are probably vestiges of the episternal bone of the monotremata and lizards. Thus, the first piece may have two, three, or even six centers. When two are present, they are generally situated one above the other, the upper being the larger; the second piece has seldom more than one; the third, fourth, and fifth pieces are often formed from two centers placed laterally, the irregular union of which explains the rare occurrence of the sternal foramen [Fig. More rarely still the upper end of the sternum may be divided by a fissure. Union of the various centers of the body begins about puberty, and proceeds from below upward [Fig. The xiphoid process may become joined to the body before the age of thirty, but this occurs more frequently after forty; on the other hand, it sometimes remains ununited in old age. In advanced life the manubrium is occasionally joined to the body by bone. When this takes place, however, the bony tissue is generally only superficial, the central portion of the intervening cartilage remaining unossified. Clinical significance[edit] Bone marrow biopsy[edit] Because the sternum contains bone marrow, it is sometimes used as a site for bone marrow biopsy. In particular, patients with a high BMI obese or grossly overweight may present with excess tissue that makes access to traditional marrow biopsy sites such as the pelvis difficult. Sternal opening[edit] A somewhat rare congenital disorder of the sternum sometimes referred to as an anatomical variation is a sternal foramen, a single round hole in the sternum that is present from birth and usually is off-centered to the right or left, commonly forming in the 2nd, 3rd, and 4th segments of the breastbone body. Congenital sternal foramina can often be mistaken for bullet holes. Sternal fracture Fractures of the sternum are rather uncommon. A fracture of the sternum is usually a comminuted fracture. The most common site of sternal fractures is at the sternal angle. Some studies reveal that repeated punches or continual beatings, sometimes called "breastbone punches", to the sternum area have also caused fractured sternums. Those are known to have occurred in contact sports such as rugby and football. Sternal fractures are frequently associated with underlying injuries such as pulmonary contusions, or bruised lung tissue. It may also result from minor trauma where there is a precondition of arthritis. Resection[edit] The sternum can be totally removed resected as part of a radical surgery, usually to surgically treat a malignancy, either with or without a mediastinal lymphadenectomy Current Procedural Terminology codes and, respectively. Bifid sternum or sternal cleft[edit] A bifid sternum is an extremely rare congenital abnormality caused by the fusion failure of the sternum. It is endochondral in origin. In amphibians and reptiles it is typically a shield-shaped structure, often composed entirely of cartilage. It is absent in both turtles and snakes. In birds it is a relatively large bone and typically bears an enormous projecting keel to which the flight muscles are attached.

Paterson (The Human Sternum,), who examined specimens, points out that these ridges are altogether absent in per cent.; that in 69 per cent. a ridge exists opposite the third costal attachment; in 39 per cent. opposite the fourth; and in 4 per cent. only, opposite the fifth.

This article has been cited by other articles in PMC. Abstract Sternal variations and anomalies have been identified in the past during autopsy or cadaveric studies. Recently, an increasing number of minor sternal variations have been reported with the advent of multidetector computed tomography CT. Although there are many sternal variations that occur with varying appearance and prevalence, most of them are not recognized or are underreported during routine imaging of thorax. Identification of sternal variations is important to differentiate from pathological conditions and to prevent fatal complications prior to sternal interventions like marrow aspiration or acupuncture. This article aims to describe the minor and asymptomatic sternal variations by multidetector CT and their clinical significance. Indian population, multidetector computed tomography, sternal cleft, sternal foramen, sternal variations, suprasternal ossicle, xiphoid foramen Introduction Sternal variations can occur in manubrium, body, or xiphoid. With the increasing use of multidetector computed tomography MDCT , the sternal variations can be identified more frequently. In a large series, sternal variations and anomalies were characterized based on macroscopic[1] and radiographic[2] appearances in autopsy populations. In another series involving living subjects, the frequency of sternal anomalies has been described based on radiograph,[3 , 4] helical computed tomography CT ,[5 , 6] and magnetic resonance imaging MRI [7] appearances. Recently, sternal variations have been studied by MDCT in different populations. The entire sternum including xiphoid process was included in all the cases. The common scanning parameters were: For isotropic resolution, we recommend 1 mm axial and multiplanar reconstruction image thickness. For better identification of sternal variations, images should be initially analyzed in axial, sagittal, and coronal multiplanar reconstruction MPR using bone algorithm followed by maximum intensity projection MIP and volume rendering VR. Embryology of Sternum The sternal bone ossifies from a cartilaginous precursor. Beginning from the 5th month of prenatal life to shortly before birth, the ossification centers of manubrium and sternal body form on a cartilaginous plate on either side of midline in cranio-caudal direction. In manubrium, the ossification centers usually merge before birth. In sternal body, two or more ossification centers form on each segment of mesosternum referred as sternbrae. The ossification centers at each segment of the sternal body generally fuse to form single ossification center during years of age [Figure 1]. The calcification and fusion of sternal body segments is usually complete by 25 years of age[8 , 11 , 13 , 14] [Figure 2]. Any failure in this developmental process results in sternal variations and anomalies.