

## SKELETAL ANATOMY

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### ABSTRACT

*This professional article provides a comprehensive exploration of skeletal anatomy, elucidating the intricacies of the human skeletal system. From the axial skeleton, comprising the skull, vertebral column, and ribcage, to the appendicular skeleton, including the limbs and girdles, the article delves into the structure, functions, and significance of each component. Emphasizing the dynamic nature of bones, their role in support, protection, and hematopoiesis is discussed. With a focus on clinical relevance, the article also addresses common skeletal disorders and advancements in imaging techniques. This article aims to serve as a valuable resource for professionals in healthcare, anatomy education, and related fields, offering insights into the complexity and significance of skeletal anatomy in the human body.*

**Introduction:** Skeletal Anatomy: Unraveling the Complex Web of the Human Skeleton. The human skeletal system serves as the architectural foundation of the body, providing support, protection, and a framework for movement. This article delves into the fascinating realm of skeletal anatomy, shedding light on its various components, functions, and implications in both health and disease.

**Human skeleton**, 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.

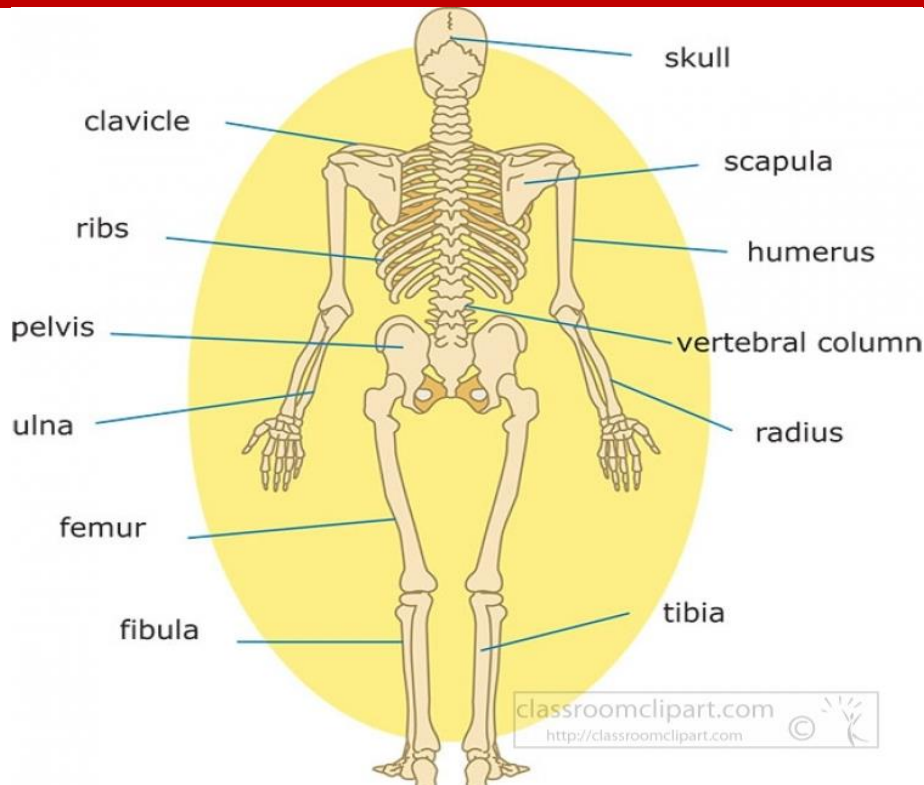
When one considers the relation of these subdivisions of the skeleton to the soft parts of the human body—such as the nervous system, the digestive system, the respiratory system, the cardiovascular system, and the voluntary muscles of the muscle system—it is clear that the functions of the skeleton are of three different types: support, protection, and motion. 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 majority of the central nervous system is contained within the axial skeleton, with the brain and spinal cord being well-protected by the skull and vertebral column, respectively, via the intervening ligaments and bony neural arches, which are the bone arches that encircle the spinal cord.

An identifying feature of humans over other mammals is their erect posture. In certain ways, the human body resembles a walking tower supported by leg pillars. This upright position has many benefits, the main one being the liberation of the arms for a wide range of applications. However, maintaining an upright posture is contributing to several mechanical difficulties, particularly with weight bearing. These issues have required that adaptations of the skeletal system.

The issue with protecting the heart, lungs, and other organs and structures in the chest is not the same as the issue with the central nervous system. These organs require an elastic and flexible covering because their functions include movement, expansion, and contraction. The bony thoracic basket, commonly referred to as the rib cage, which makes up the skeleton of the chest wall, or thorax, provides such a covering. The comparatively malleable rib (costal) cartilages cause the ribs' secondary attachment to the breastbone, or sternum, in every situation. During breathing and other activities, the ribs can glide on the vertebrae thanks to the tiny joints that connect them. The ligamentous attachments restrict the range of action.



Motion is the third general function of the skeleton. Most skeletal muscles are securely attached to the skeleton, typically to two or more bones, sometimes to multiple bones. Thus, distinct and unique engineering arrangements between muscle and bone allow the body and its parts to move in a variety of ways, from the explosive lunge of a football player to the deft hand crafter or scientist using complex instruments.

The skeleton's ingredients are discussed in this article according to how they share these roles. The article on bone disease describes the conditions and traumas that can impact the human skeleton.

### **Development of cranial bones.**

The two types of bones that make up the cranium are membrane bones, which are deposited within layers of connective tissue, and cartilaginous, or substitution, bones, which replace cartilages that are preformed in the general shape of the bone. The membrane bones make up the sides and roof of the cranium, whereas the replacement bones primarily form the floor.

Although there is a large range in the cranial cavity's capacity, it is not directly correlated with the size of the skull due to differences in bone thickness and the size of air pockets, or sinuses. The floor of the cranial cavity is rough and uneven, but its landmarks and structural details typically stay the same from one skull to the afterwards.

The cranium forms all the upper portion of the skull, with the bones of the face situated beneath its forward part. It consists of a relatively few large bones, the frontal bone, the sphenoid bone, two temporal bones, two parietal bones, and the occipital bone. The frontal bone underlies the forehead region and extends back to the coronal suture, an arching line that separates the frontal bone from the two parietal bones, on the sides of the cranium. In front, the frontal bone forms a joint with the two small bones of the bridge of the nose and with the zygomatic bone (which forms part of the cheekbone; see below The facial bones and



their complex functions), the sphenoid, and the maxillary bones. Between the nasal and zygomatic bones, the horizontal portion of the frontal bone extends back to form a part of the roof of the eye socket, or orbit; it thus serves an important protective function for the eye and its accessory structures.

### **Interior of the cranium**

The interior of the cranium shows a multitude of details, reflecting the shapes of the softer structures that are in contact with the bones.

The internal surface of the vault is relatively uncomplicated. In the midline front to back, along the sagittal suture, the seam between the two parietal bones, is a shallow depression—the groove for the superior longitudinal venous sinus, a large channel for venous blood. A number of depressions on either side of it mark the sites of the paccchionian bodies, structures that permit the venous system to absorb cerebrospinal fluid. The large thin-walled venous sinuses all lie within the cranial cavity. While they are thus protected by the cranium, in many places they are so close beneath the bones that a fracture or a penetrating wound may tear the sinus wall and lead to bleeding. The blood frequently is trapped beneath the outermost and toughest brain covering, the dura mater, in a mass called a subdural hematoma.

Conspicuous markings on the internal surface of the projection of the sphenoid, called the greater wing, and on the internal surfaces of the parietal and temporal bones are formed by the middle meningeal artery and its branches, which supply blood to the brain coverings. Injury to these vessels may lead to extradural hematoma, a mass of blood between the dura mater and the bone.

### **Axial Skeleton: The Core Framework**

The axial skeleton forms the core of the skeletal system, encompassing the skull, vertebral column, and ribcage. The skull, a mosaic of bones, cradles and protects the brain. The vertebral column, a flexible tower of vertebrae, not only supports the body but also houses the spinal cord. The ribcage shields vital organs, such as the heart and lungs, emphasizing the axial skeleton's role in safeguarding internal structures.

#### **Appendicular Skeleton: The Locomotor System**

Extending from the axial skeleton, the appendicular skeleton comprises the limbs and their respective girdles. The upper limbs, attached to the pectoral girdle, provide dexterity and reach, while the lower limbs, anchored to the pelvic girdle, facilitate mobility and weight-bearing. The articulation of bones within these appendages allows for a diverse range of movements essential for daily activities.

#### **Bone Structure: A Symphony of Microscopic Architecture**

Bones, remarkable for their strength and resilience, exhibit a hierarchical structure. Microscopically, bones consist of cortical bone, dense and compact, and trabecular bone, a lattice-like network providing strength while minimizing weight. Understanding this structure is pivotal for comprehending bone function and response to stress.

#### **Bone Functions: Beyond Support and Protection**

Bones are dynamic organs, serving multifaceted functions. Beyond providing a framework, bones act as reservoirs for minerals, such as calcium and phosphorus, crucial for metabolic processes. Additionally, bones play a pivotal role in hematopoiesis, the production of blood cells transpiring within the bone marrow.



## Joint Anatomy: The Art of Articulation

Joints, the meeting points of bones, exhibit diverse structures to accommodate various movements. Synovial joints, characterized by synovial fluid-filled cavities, permit intricate motions, contrasting with fibrous and cartilaginous joints, which offer stability and limited mobility. Understanding joint anatomy is pivotal for diagnosing and treating conditions affecting these structures.

## Skeletal Disorders: Navigating Challenges

Despite their resilience, bones are susceptible to disorders. Osteoporosis, characterized by weakened bone density, poses a threat to skeletal integrity, especially in aging populations. Arthritis, inflammation of joints, and fractures, disruptions in bone continuity, further underscore the need for a nuanced understanding of skeletal disorders.

## Clinical Applications: From Diagnosis to Intervention

In the realm of medicine, skeletal anatomy holds significant clinical relevance. Imaging techniques, including X-rays, CT scans, and MRI, enable precise visualization of skeletal structures, aiding in the diagnosis of fractures, tumors, and degenerative conditions. Orthopedics, the medical specialty dedicated to musculoskeletal health, relies on a profound understanding of skeletal anatomy for surgical and non-surgical interventions.

**Conclusion:** The Ongoing Exploration. As we unravel the complexities of skeletal anatomy, the intricate interplay of form and function becomes increasingly apparent. From the microscopic architecture of bones to the clinical applications shaping modern medicine, the study of skeletal anatomy remains a dynamic and evolving field. This article provides a gateway to this multifaceted realm, inviting professionals, students, and enthusiasts alike to explore the marvels of the human skeleton.

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