

## Basic anatomic structures I

### Skin, Fascia, Bones, Cartilages, Joints, Ligaments and Bursae

**Curricular Objectives: By the end of this session students are expected to:**

#### **Theory**

1. List the basic structures forming the human body
2. Describe the skin and its appendages
3. Outline the main features and distribution of superficial and deep fascia
4. Describe the classification systems by which bones are organized
5. Acknowledge (no need to recall) the meanings of the main bone markings
6. Identify the major categories of joints and the structures that characterize each type of joint. Provide examples of each type of joint
7. Identify the structures responsible for maintaining the stability of joints
8. Define ligaments and outline their functions
9. Define and differentiate a bursa and synovial sheath

#### **Practical**

1. Identify various components and appendages of skin
2. Distinguish the superficial and deep fascia
3. Distinguish various types of bones
4. Identify the major parts of long bones
5. Label the major bones forming the axial and appendicular skeleton
6. Name and identify the major types of joints
7. Label the large joints of the upper and lower limbs

#### **Selected references and suggested resources**

- ✦ Clinical Anatomy by Regions, Richard S. Snell, 10<sup>th</sup> edition
- ✦ Grant's Atlas of Anatomy, 13<sup>th</sup> Edition
- ✦ McMinn's Clinical Atlas of Human Anatomy, 7<sup>th</sup> Edition
- ✦ [Anatomy for Babylon medical students](#) (Facebook page)
- ✦ [Anatomy for Babylon medical students](#) (YouTube channel)
- ✦ [Human Anatomy Education](#) (Facebook page)
- ✦ [Human anatomy education](#) (YouTube channel)

#### **Feedback and suggestions**

- ✦ <http://goo.gl/forms/SjyjGeUpvH>

#### **Session check list**

##### **❖ Clinical importance**

- Knowledge of skin anatomy is essential for management of many clinical conditions (eg. Burn, Psoriasis) and when making surgical incisions. Many systemic illnesses show their signs on skin and can be diagnosed during physical examination.
- Bones fractures are a common emergency condition. Bones tumors, infections are also common. Knowledge of bone structure and structures related structures can help in diagnosis and treatment of many bone problems.
- Joints are vulnerable to dislocations structural damage and arthritis. Knowledge of the anatomy of joints is indispensable for management of diseased joints

### ❖ The basic structures forming the human body

- From skin to bone, various structures lie in between to form the human body
- They are found as part of one of the major body systems like musculoskeletal system

### ❖ The Skin and fascia

- The skin is the largest organ of the body. It consists of the epidermis and the dermis.
- The epidermis is avascular and is thicker in regions exposed to mechanical friction.
- At the skin creases, the skin is thinner and is firmly tethered to underlying structures.
- The tension lines (also called cleavage lines or Langer lines) arrange according to the direction of the collagen fibers within the dermis. Surgical incisions along tension lines produce minimum scar postoperatively
- There are four appendages of skin, nails, hair follicles, sebaceous glands, and sweat glands.
- The superficial fascia (subcutaneous tissue) between the dermis and deep fascia.

### ❖ Bones and cartilages

- The skeleton of the human body is made of bones and cartilages
- The skeleton is divided into appendicular and axial parts
- The appendicular skeleton consists of the bones of the upper and lower limbs
- The axial skeleton consists of the bones of the head, neck and trunk
- Bones are classified according to their general shape into five groups. Long bones have greater length than breadth. Short bones are roughly cuboidal in shape. Flat bones have inner and outer layers of compact bone with cancellous bone in between. Irregular bones are those not in any other group
- Bones are covered by periosteum except at the articulating surfaces
- Many bones have surface markings with special names. They appear wherever tendons, ligaments, fascias, arteries are attached, lie adjacent or pass through the bones.

### ❖ Joints

- They are classified according to tissue type found between the bone ends forming the joint
- Synovial joints are classified according to the shape of the articular surfaces and the types of movements they permit
- There are three types of joints and six major types of synovial joints
- Joints are innervated according to **Hilton's law** which states that "*the nerve supplying the muscle acting at a given joint, also innervates that joint*"
- Each joint has three factors contributing to its stability:
  1. The articular surfaces (shape, size, arrangement)
  2. The Ligaments around the joint
  3. The muscles (tone) around the joint

### ❖ Ligaments

- They bind bones at joints
- **Elastic ligaments** regain their original length after stretching
- Excessive stretching can damage ligaments leading to pain around joint

### ❖ Bursa and synovial sheath

- Bursa is a closed fibrous sac, lined with synovial membrane, serve to reduce friction
- Synovial sheath is a tubular bursa that surrounds a tendon to reduce friction

## Lab activity list

For each task below, identify the listed structures then answer the related questions

### ❖ Task 1 (skin and fascia)

- ✓ Palmar skin creases
- ✓ Hair Follicle/ Sweat gland/ Sebaceous gland/ Nail/ Arrector pili muscle
- ✓ Superficial fascia (Subcutaneous fat)
- ✓ Deep fascia
- ⊕ What are the actions of arrector pili muscle?
- ⊕ Which of the above structures forms the compartments within upper and lower limbs?

### ❖ Task 2 (Bones)

- ✓ Long/Short/ Irregular/ Flat/ Sesamoid Bones
- ✓ Epiphysis/Epiphyseal cartilage (line)/Metaphysis/Diaphysis
- ✓ Some examples of bones

No	Appendicular skeleton		Axial skeleton
	Upper limb bones	Lower limb bones	
1.	Clavicle	Hip	Skull
2.	Scapula	Femur	Vertebrae
3.	Humerus	Tibia	Sternum
4.	Radius	Fibula	Ribs
5.	Ulna	Tarsal bones	
6.	Carpal bones	Metatarsals	
7.	Metacarpals		

- ⊕ The humerus, femur and phalanges are \_\_\_\_\_ bones. (a. long b. short c. flat)
- ⊕ Which of the following bones is a flat type of bone? (a. tibia b. tarsals c. sternum)
- ⊕ The clavicle is located between two bones, name them
- ⊕ The metaphysis is located at which part of the growing long bone?

### ❖ Task 3 (Joints)

- ✓ Fibrous Joints
- ✓ Cartilaginous Joints (Primary/Secondary)
- ✓ Synovial Joints (Capsule/ Synovial membrane)
- ✓ Some examples of joints

No	Upper limb joints	Lower limb joints	Other joints
1.	Shoulder (synovial/ ball & socket)	Hip (synovial/ ball & socket)	Sutures of skull (fibrous)
2.	Elbow (synovial/ hinge)	Knee (synovial/ hinge)	Vertebral bodies (cartilaginous/ symphysis)
3.	Wrist (synovial/ ellipsoid)	Ankle (synovial/ hinge)	Symphysis Pubis (cartilaginous/ symphysis)

- ⊕ The shoulder joint is made by articulations between which bones?
- ⊕ What movements are possible at the elbow joint?

**Review questions:**

1. A skin wound did not bleed. This suggests that it DID NOT penetrate which layer?
2. What is the direction of surgical incision on the abdominal wall that produces minimum scarring?
3. Which skin gland is connected to the hair follicle?
4. In the image on the right, the arrow A is pointing at which layer? What lies deep to it? What characterizes this layer at the palm of the hand?
5. Classify the following bones according to their shape and region!
  - a. Ribs
  - b. Scapula
  - c. Radius
  - d. Carpal bones
6. What are sesamoid bones?
7. What is the meaning of the term, joint?
8. What type of joint connects the epiphysis and diaphysis together? Is it permanent or temporary?

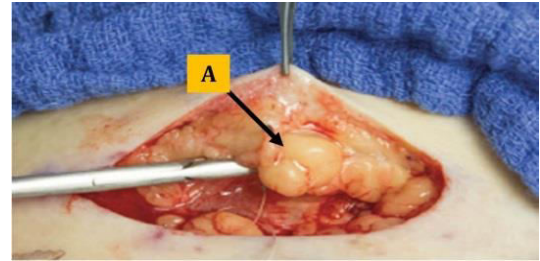


Image source:

<https://accessemergencymedicine.mhmedical.com/content.aspx?bookid=2076&sectionid=156454186>

**Homework:**

1. A 20 years old male was cut with a knife in his upper chest. The wound was 4 cm long. Predict (with explanation) the shape of the scar (sightly/unsightly) if the wound is running:
  - A. Transversely across the front of the chest
  - B. Vertically across the front of the chest
2. A 10 years old girl was playing when she fell to the ground with her outstretched hands. She felt of severe pain and swelling developed rapidly few centimeters above the right elbow joint. On examination the girl was unable to move her forearm and X-ray showed supracondylar fracture of the right humerus.
  - A. Most of the pain originates from which part of the bone?
  - B. What causes the swelling around fracture site?
  - C. Apart from examining the fractured bone, what other basic anatomical structures need to be examined because they may be affected by fractured bone ends?